IAVE

INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

— U. S. Steel Corp.

Field tripst on approach to studying about industry firsthand in I-E programs
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- ☐ Special Report: On Opening the School Shop (pg. 35)
- ☐ Also: Technical Education; Research; Design; 13 Ideas for Activity and Teaching Aids

September, 1961

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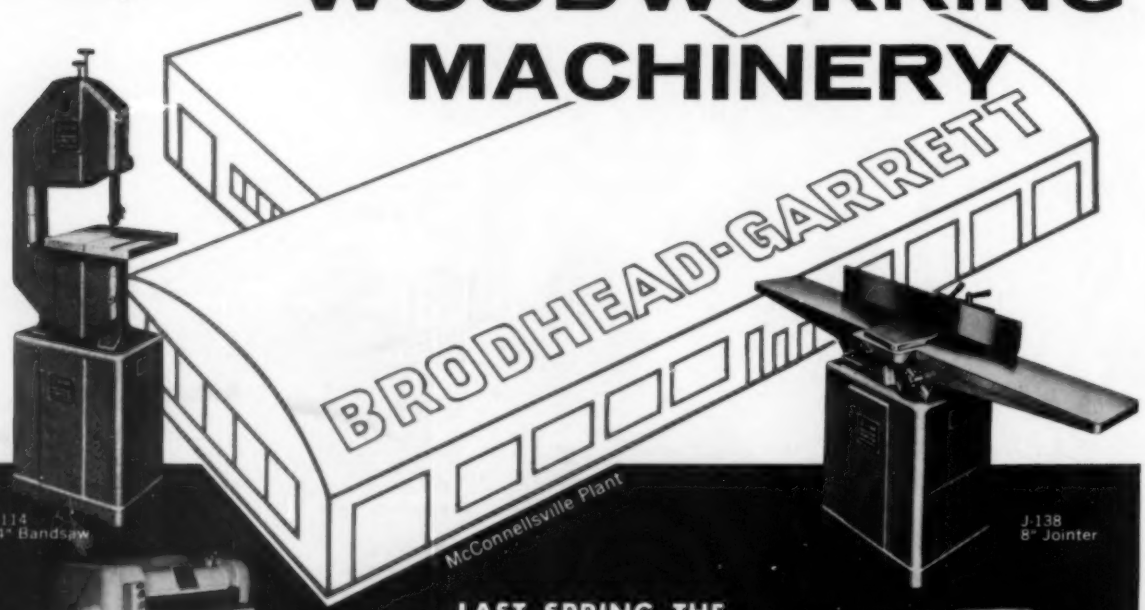

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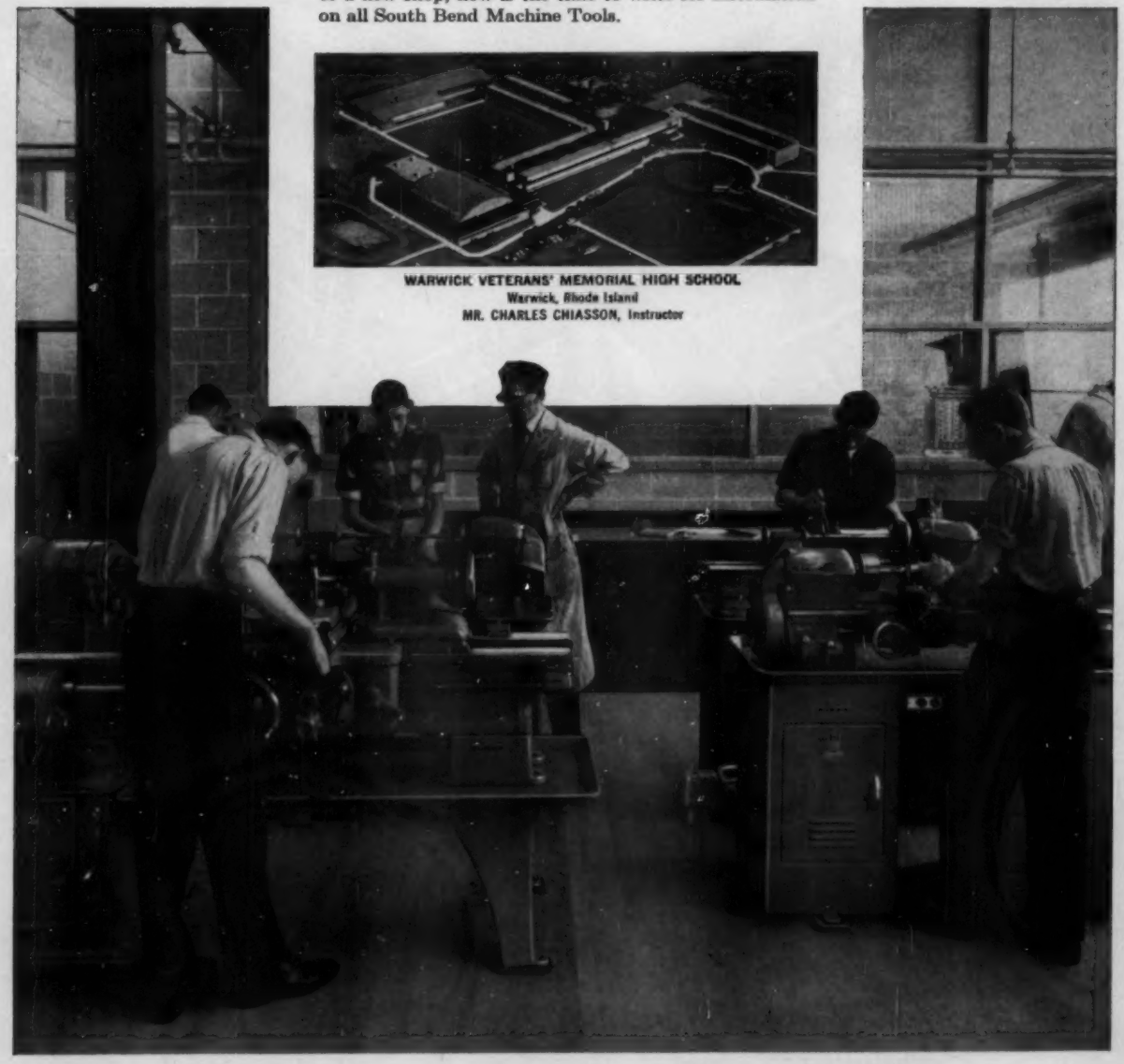

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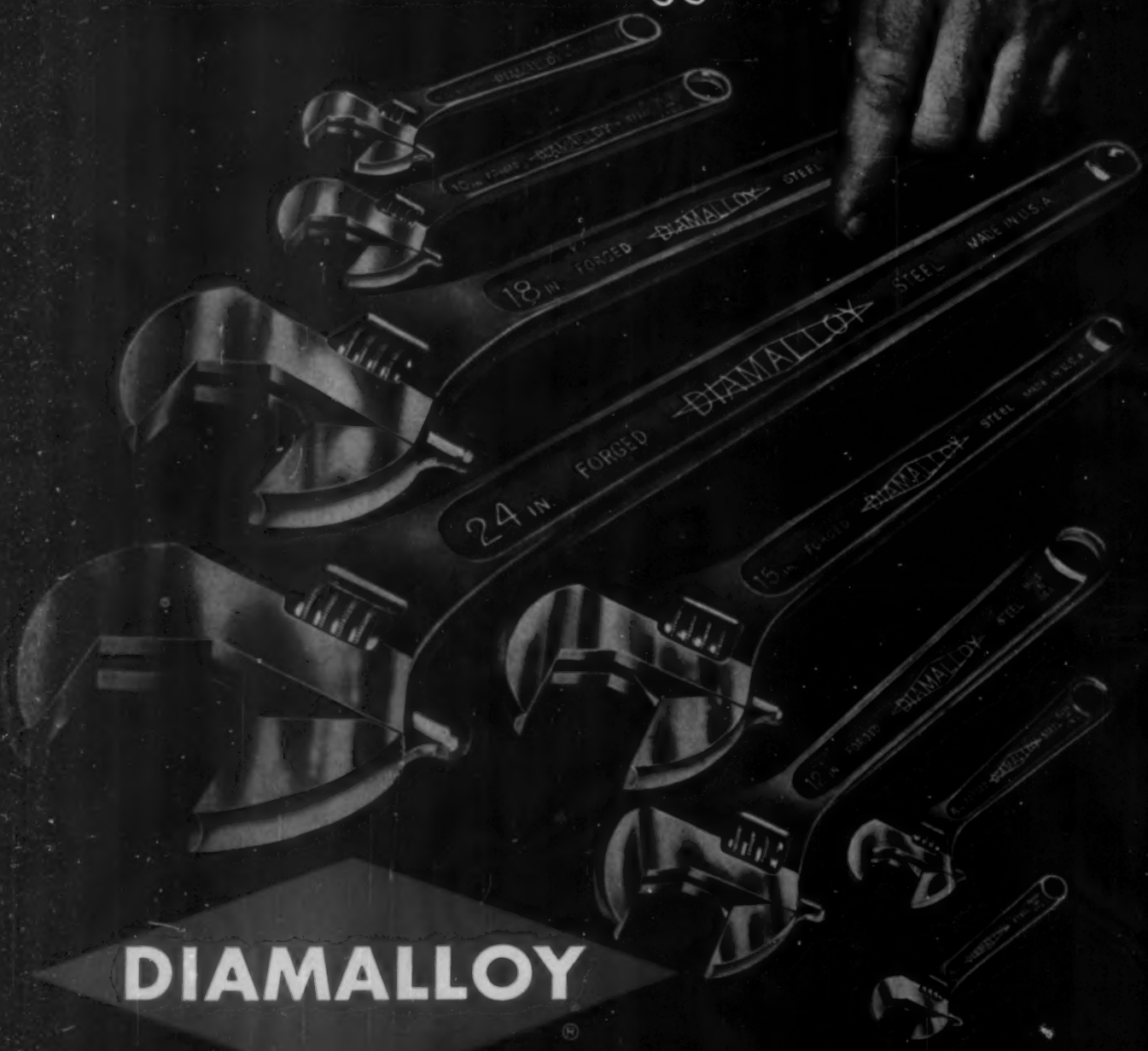

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INDUSTRIAL ARTS AND VOCATIONAL EDUCATION

September, 1961 Vol. 50, No. 7

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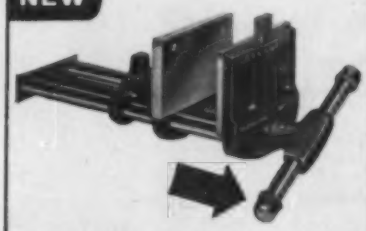

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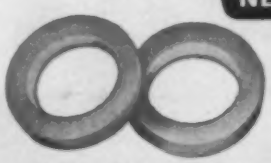

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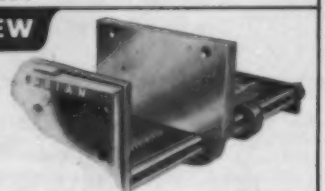

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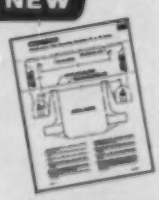

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news

The Wisconsin State Board of Regents has announced **the appointment of William J. Micheels,** former chairman of the department of industrial education at the University of Minnesota at Minneapolis, **as president of Stout State College** at Menomonie, Wis. Dr. Micheels succeeded the retired Dr. Verne C. Fryklund on September 1. (For further details on Dr. Fryklund's retirement, see page 23.) □

In a report published by Engineers Joint Council, Inc., on recent achievements and future **goals of the Soviet Union concerning engineering education and manpower utilization,** it was indicated that the USSR annually graduates approximately 117,000 engineers (as compared to 38,000 for the United States). In addition, the report pointed up some of the techniques employed by the Russians to increase the number and quality of the graduates. □

At a convention of the International Association of Personnel in Employment Security, David E. White, personnel director of the Kennecott Refining Co., Baltimore, stated that the **schools were training students to "go into jobs that are non-existent."** He called for a realistic re-evaluation of vocational education in the high school and suggested that high school counselors begin talking to students when they are freshmen, giving them up-to-date market information. □

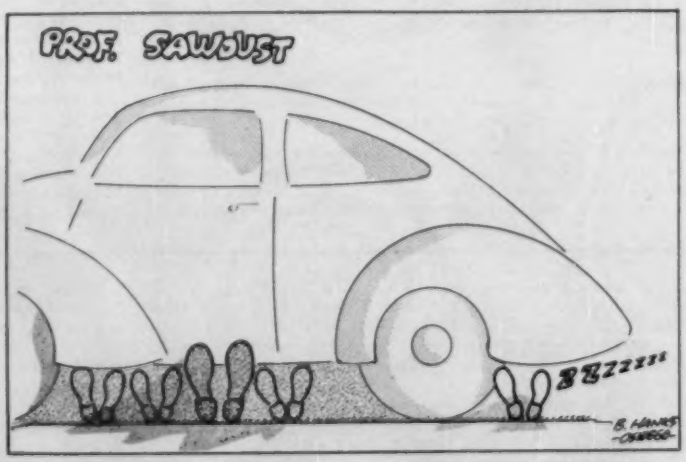
In a statement to the House Subcommittee on Education supporting the expansion of the National Defense Education Act, Sterling M. McMurrin, U. S. Commissioner of Education, lauded **Title VIII** (Area Vocational Education Programs) **for its role as "an important stimulus in the strengthening of instruction in technical subjects** vital to our national defense and well-being. It has made possible, for example, the conduct of rigorous instruction for preparation of high-level technicians in many geographical areas where such instruction has been hitherto unavailable. . . . The success of this title has given valuable indications relative to the future pattern of vocational education."

Other speakers supporting this title of NDEA included William B. Logan, AVA president, and Peter T. Schoemann, vice-president, AFL-CIO. □

A study of the **impact of automation and other technological developments on education** has been announced by the National Education Association. Financed by a grant from the International Business Machines Corporation, this project will consider such topics as: how to prepare the new generation for greater excellence in the complex world of science and technology; how to retrain workers who have been thrown out of work by automation; how to organize educational programs for on-the-job professional people who want to refresh their knowledge; how to educate citizens for sensible and constructive use of leisure time. The study will be directed by Luther H. Evans, former librarian of congress; an advisory group of teachers, scientists, industrialists, labor leaders, etc., will be chaired by Arthur S. Flemming, former HEW secretary. □

The Ford Foundation has turned its financial attention to **combating the growing problem of youngsters who drop out of school** in a two-phase program: (1) a grant of $910,000 for helping dropouts in Detroit, Philadelphia, St. Louis, and Richmond, Calif.; and (2) a grant of $190,000 to the National Education Association to establish in Washington a national

(Concluded on page 7)



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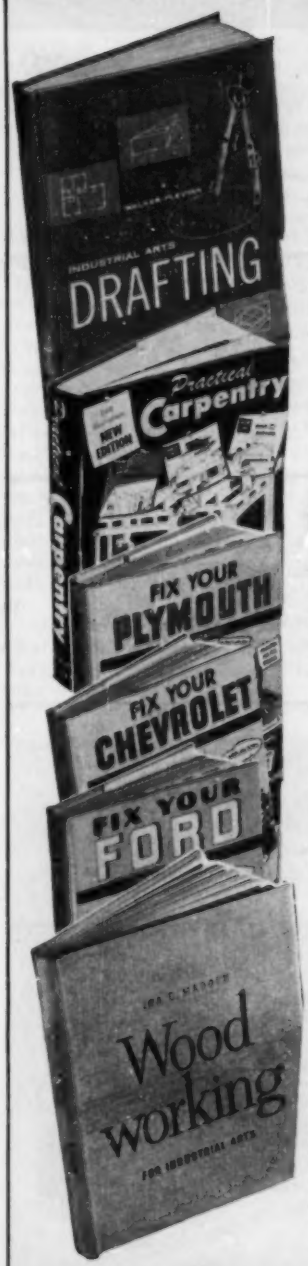

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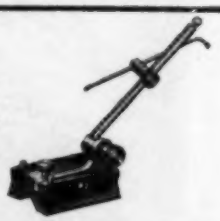

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NEWS

(Concluded from page 4)

clearinghouse of programs in this area. The Foundation cited the statistic that nearly four of every ten students drop out of high school; in addition, in blighted, urban areas, the dropout rate is as high as six or eight out of every ten. On the local district level, efforts will center around after-school workshops, job counseling and placement, etc.; the NEA clearinghouse will collect, analyze, and keep current information on efforts to deal with youth unemployment programs.

Another facet of the concern for the dropout problem was the first national Conference on Unemployed, Out of School Youth which considered the school's effort in vocational guidance and placement services. Increase of funds for expanded vocation education was recommended by representatives of the administration. And Philadelphia's superintendent, Allen H. Wetter, proposed his district's division of vocational and industrial arts education pay dropouts to learn salable skills in 30 hours for 13 weeks, in a pilot program; he requested federal and/or state funds to meet the total cost, including coordinators for placement and follow-up. □

At the annual Industrial Arts Spring Conference sponsored by the New York State University College of Education at Oswego, Mr. Solomon Barkin, director of research for the Textile Workers Union of America, indicated that **American industry is moving toward a period of requiring conceptual skills,** rather than semi-skilled manual operations. The role of the worker in a semi-automated society has been changed from earlier periods of American industry in that, according to Mr. Barkin, the function of an employee has radically changed, from that of a worker to that of an attendant. □

The **Industrial Arts Fall Conference of the State University of New York at Buffalo** will hear Dr. George S. Counts, professor of education at Michigan State University speak on "The Technological Revolution and Its Relationship to the Need for Excellence" and "The Challenge of Soviet Education." The conference will be held on October 20. □

Stout State College at Menomonie, Wis., **will hold its eighth Industrial Education Conference** on September 22 featuring sessions on: the technology program, amateur radio, what industry expects of high school drafting graduates, molding plastic foam, eutectic welding alloys, planning and producing 2 by 2 color slides, and engine analysis with the Anal-O-Scope. Set up of the above sessions on an hourly basis will enable conferees to attend four discussions. Tours of Fryklund Hall, the school's new million dollar shop-laboratory-classroom building are also planned. □

COMING CONVENTIONS

Sept. 29–30. Ohio Vocational Association, at Southern Hotel, Columbus, Ohio. Exhibit chairman: Walter R. Lund, 3520 Central Parkway, Cincinnati 23, Ohio.

Oct. 6–7. Four State Industrial Arts Conference, at Kansas State College Campus, Pittsburg. Exhibit chairman: Forest L. Penny, Industrial Education Department, Kansas State College, Pittsburg, Kans.

Oct. 13–14. New England Industrial Arts Teachers Association, at Hotel Viking, Newport, R. I. Secretary: Edward P. Stach, Warren Harding High School, Bridgeport 10, Conn.

Oct. 19–20. Iowa State Education Association, at Veterans Memorial Auditorium, Des Moines, Iowa. Exhibit chairman, Joe Fisher, 4025 Tonawanda Drive, Des Moines, Iowa.

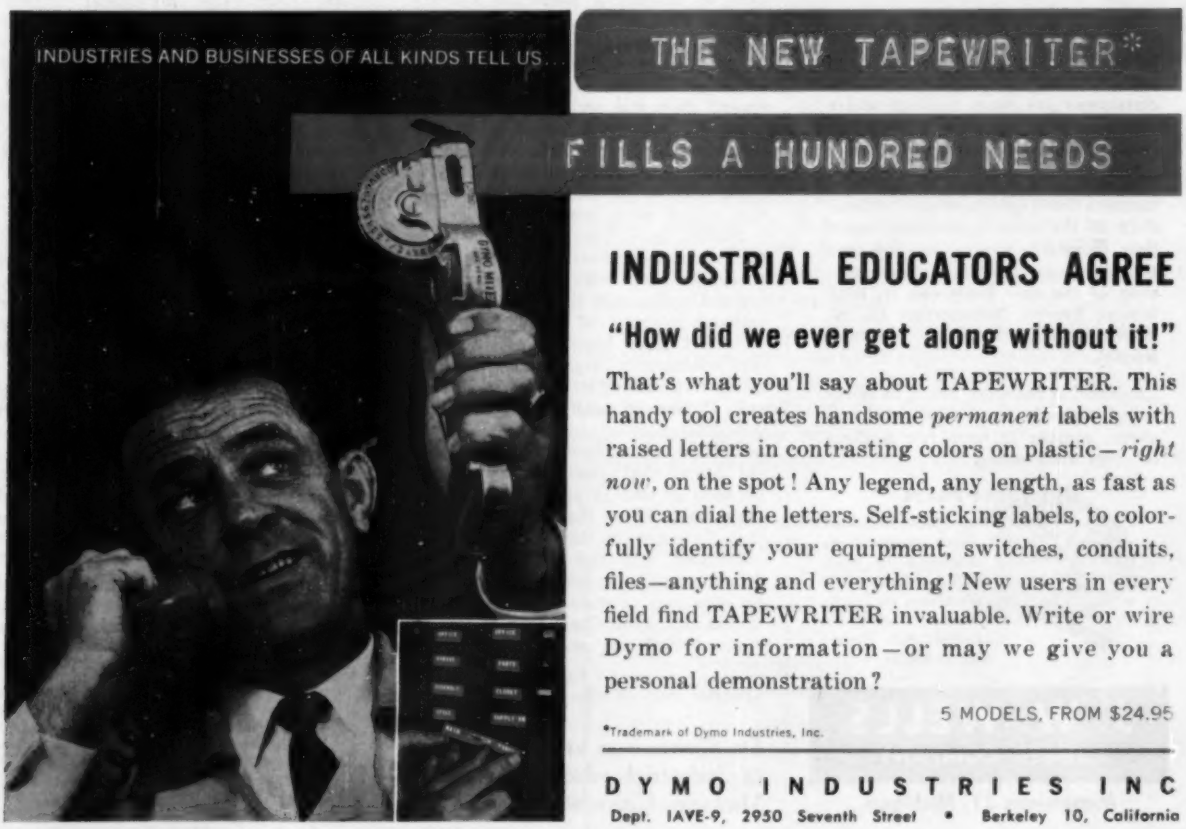
Oct. 19–20. Minnesota Vocational Association, at Nicollet Hotel, Minneapolis, Minn. Exhibit chairman: Louis Derby, 4th Ave. & Grant St., Minneapolis 4, Minn.

Oct. 20–21. Industrial Arts Association of Pennsylvania, at Hershey, Pa. Secretary: William C. Bohn, 9 Hindman Ave., Burgettstown, Pa.

Oct. 27–28. Oklahoma Industrial Arts Association, at Oklahoma City University Campus, Oklahoma City, Okla. Exhibit chairman: George Dusbabek, 23rd and Blackwelder, Oklahoma City, Okla.

Nov. 3–4. Kentucky Industrial Education Association, at Kentucky Hotel, Louisville, Ky. Exhibit chairman: Paul E. Harris, 506 W. Hill St., Louisville, Ky.

Nov. 10–11. Oregon Industrial Arts Association, at High School, Medford, Ore. Exhibit chairman: Vern Voss, High School, Medford, Ore. □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NORTHERN MAPLE

Schools yielding to economy claims of easily dented composition floors for classrooms are more cautious where expensive tools and machinery are involved—a recent survey indicates.*

Except in auto mechanic shops where concrete floors generally predominate most of the shop supervisors report they "prefer" floors like the one shown above in the metalworking shop of the new Evergreen Jr. High School, Everett, Washington (J. W. Wells DIAMOND HARD Northern Maple).

Composition floorings, No. 2 to Hardwood Strip in mechanical drawing shops, appear to have few backers in other shop areas.

Use These Facts

* For "Facts on Floors in School Shops"—kinds now installed, kinds preferred in each area (Woodworking, Printing, Electricity, etc.) compiled from a survey by Industrial Arts Magazine — WRITE —

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research

Adolescent Vocational Interests Versus Industrial Exploratory Experiences

WILLIAM P. SPENCE

In many of our junior high schools will be found an industrial arts course commonly called general shop. In theory this is to be a broad, exploratory experience giving youth the opportunity to have experiences in many industrial areas. Youth are supposed to use a variety of materials and tools and machines. They are supposed to have planning experiences, designing experiences, and leadership and followership experiences. From all of this it is hoped, among other things, youth will form some judgments and have some opinions concerning the world of work and the occupations therein. He may find he likes or dislikes a particular activity.

It is believed that these junior high school years are formative years. Years in which the vocational interests of youth are formed. Upon this basis the general shop was and is taught.

Are the junior high school years really the best time to offer broad exploratory industrial experiences or would they be more effective if offered in the senior high school when youth are older?

Studies have been made concerning the vocational interests of youth, the acceptance and rejection of vocational interest areas, and the stability of vocational interests of adolescents.

Studies have been made that show that adolescents vary in their likes and dislikes at various stages of maturation.

E. K. Strong[1] made several studies of the differences in interests which are associated with the differences in age. He found that the interests of men between 25 and 55 years of age change very little. When the slight differences that do occur in this age bracket are contrasted with the differences to be found among occupational groups or between men or women, or between unskilled and professional men, it must be realized that age and experience that goes with age change an adult man's interests very little. At 25 years of age he is largely what he is going to be and even at 20 years of age he has acquired pretty much the interests he will have throughout life. The interests of some are pretty well crystallized by age 18.

Fryer[2] summarized studies of the vocational interests of adolescents. He concluded that both estimated and inventoried interests would seem to indicate that there is an increase in permanence throughout elementary school, high school, and college and that interests have better than a 50 per cent chance of remaining permanent at these times.

He found that vocational interest trends go through a gradual process of change and are likely to be *quite different in later adolescence to what they were in early childhood.* Fryer said, "When all this has been said however, there is permanence or stability of interests to a surprising degree. It is made clear that what have been one's vocational interests in the past are the foundation of one's present interests."

A study made by Traxler and McCall[3] involving students in grades 10, 11, and 12 indicated that *interests are relatively mature by the time pupils reach the secondary school* and that there are no consistent trends toward greater stability with increase in grade level.

Jackson[4] investigated the relationship between dominant vocational preferences and the vocational course selected in the ninth grade of high school and also the relationship between measured vocational interests and courses completed in high school. He found that when *elective courses* are taken in the ninth grade, they seem to *encourage a crystallization* of vocational interests on that level and the permanence of these vocational interests is significantly related to

Dr. Spence is an associate professor of industrial education, Western Michigan University, Kalamazoo.

[1] Strong, E. K., Jr., *Change of Interest With Age* (Palo Alto, Calif.: Stanford University Press).

[2] Fryer, D., *Measurement of Interests* (New York: Henry Holt Publishing Company).

[3] Traxler, A. E., and McCall, W. C., "Some Data on the Kuder Preference Record," *Educational and Psychological Measurement*, July, 1941.

[4] Jackson, Joseph, "A Note on the Crystallization of Vocational Interests," *The Journal of Social Psychology*, Aug., 1947.

(Concluded on page 10)

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RESEARCH

(Concluded from page 8)

courses completed upon graduation from high school.

An article on the measurement of interest by Fred Fowler[5] stated that:

". . . all interests are learned and therefore present interests may be modified, yet it is generally agreed that interests even at the high school level, are marked by patterns which have increasing stability with advancing age."

Super[6] seems to pull these findings together. He stated:

"By adolescence most young people have had opportunities to explore social, linguistic, mathematical, technical and business activities to some extent: they have sought to identify with parents, other adults, and schoolmates and have rejected some and accepted other's of these identifications: self concepts have begun to take definite form. For these reasons *interest patterns begin to crystallize by early adolescence and the exploratory experiences of the adolescent years in most cases merely clarify and elaborate upon what has already begun to take shape*. Some persons experience significant changes during adolescence and early childhood, but these are most often related to endocrine changes, and less often to changes in self-concept resulting from having attempted to fit into an inappropriate pattern. Vocational interest patterns generally have a substantial degree of permanence at this stage. For most persons, adolescent exploration is an awakening to something that is already there."

[5] Fowler, Fred M., "Interest Measurement: Questions and Answers," *School Life*, Dec., 1945.
[6] Super, Donald E., "Vocational Interests and Vocational Choice: Present Knowledge and Future Research in the Relationships," *Educational and Psychological Measurement*, autumn, 1947.

Just what significance do the findings of these studies and the work of these men have for industrial educators?

It would seem from the research completed that the years of junior high school and even the fifth and sixth grades would be the logical place for broad exploratory industrial experiences. These years would be poor for stressing skill development or the selection and preparation for a specific job.

This is nothing new. Industrial teachers have said this for years. Research tends to strengthen this belief. Why then do so many industrial arts teachers have unit drafting courses in the junior high school? Why do we have so many junior high school woodshops? Just calling a woodshop a general shop is no improvement either. The course offerings must change, the equipment in the laboratory must change, the teaching techniques must change and to do this the school administrator may have to get busy and change the teacher as well.

Since research indicates that the vocational interests of youth of senior high school age are quite stable perhaps the senior high school industrial arts instructor should take advantage of this interest. We should offer youth of this age experiences in the area of their interest. Since this interest pattern is rather broad we should not offer highly specific training. Nor should we "fix-the-boy-up" so he can get a job as a welder or drill press operator upon graduation from high school.

The industrial arts experiences of senior high school youth should be of a broad exploratory nature but confined to industrial areas in which they exhibit considerable interest. Remember, these interest patterns tend to be stable.

The same is true for the youth in a vocational program. They need to be prepared in a broad family of related occupations. For example, a boy with a good, broad experience in metalworking will find he can adjust to industrial job situations and have a choice of jobs while the welder can only weld and is very limited in employment opportunities. The preparation for specific duties in industry can for a large portion of jobs be learned on the job in a short time.

The thought set forth by Donald Super that, for most persons, exploration during the adolescent years tends to awaken interests that are already there seems significant. If we do not offer a variety of experiences, if we fail to try to arouse an interest we have partially abdicated the need for having industrial arts experiences in the school.

Research in the area of vocational interest tends to indicate that in theory our industrial arts and vocational education programs are sound. We say we offer exploratory experiences in many industrial areas in the junior high school and we say we are offering a variety of experiences in a narrower area of related industries in the senior high school. Vocational people talk about preparing youth for employment in job families. Now let us get busy and do just this! □

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technical education

ATEA: History, Aims, Activities

WILLIAM N. FENNINGER

The American Association of Technical High Schools and Institutes, the forerunner of the American Technical Education Association, Inc., was organized at Cass Technical High School in Detroit in December, 1928. Of the first three presidents, one was from Canada. The founders and early officers drew up the following aims of the association:

1. Maintain ideals and philosophy for this type of education.
2. Promote the proper recognition of technical education.
3. Help to establish the legal status of technical education where needed.
4. Develop codes for technical education and to standardize nomenclature.
5. Help to delineate the type of outcomes to be expected.
6. Promote standards in the selection and testing of students of technical education.
7. Exchange ideas on the methods of supervision and administration for this type of education.
8. Further the exchange of ideas on teaching devices and methods.
9. Encourage experimentation and research in technical education.
10. Stimulate co-operation between technical education, and industry, the community and other areas of education.

Mr. Fenninger is executive secretary of the American Technical Education Association, Inc.

The committee which prepared the 1946 Yearbook prepared the following statement: "The term, technical education, technical high school course or technical institute course refers to a curriculum which is intended to prepare the student to earn a living in an occupation in which success is dependent largely upon technical information and an understanding of the laws of science and technology as applied to modern design, production, distribution and service."

Over the years it has been the policy of the A.T.E.A. to hold its annual international conventions at a time and place convenient for most of its members. In recent years its conventions have been held when and where other education associations convened. Prior to World War II, conventions were held with the National Education Association. After this War, the annual conventions have been co-ordinated with the meetings of the American Vocational Association.

World War II and the national survey of the need for technical education —

(Continued on page 14)

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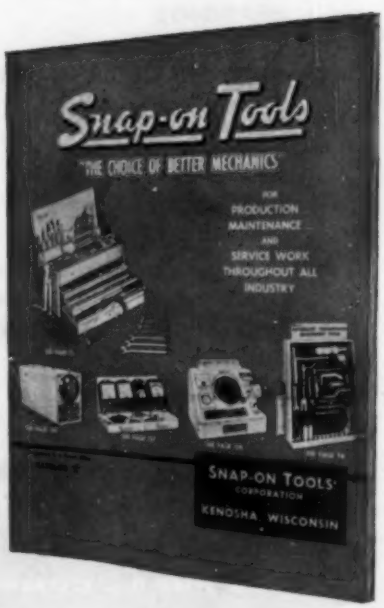
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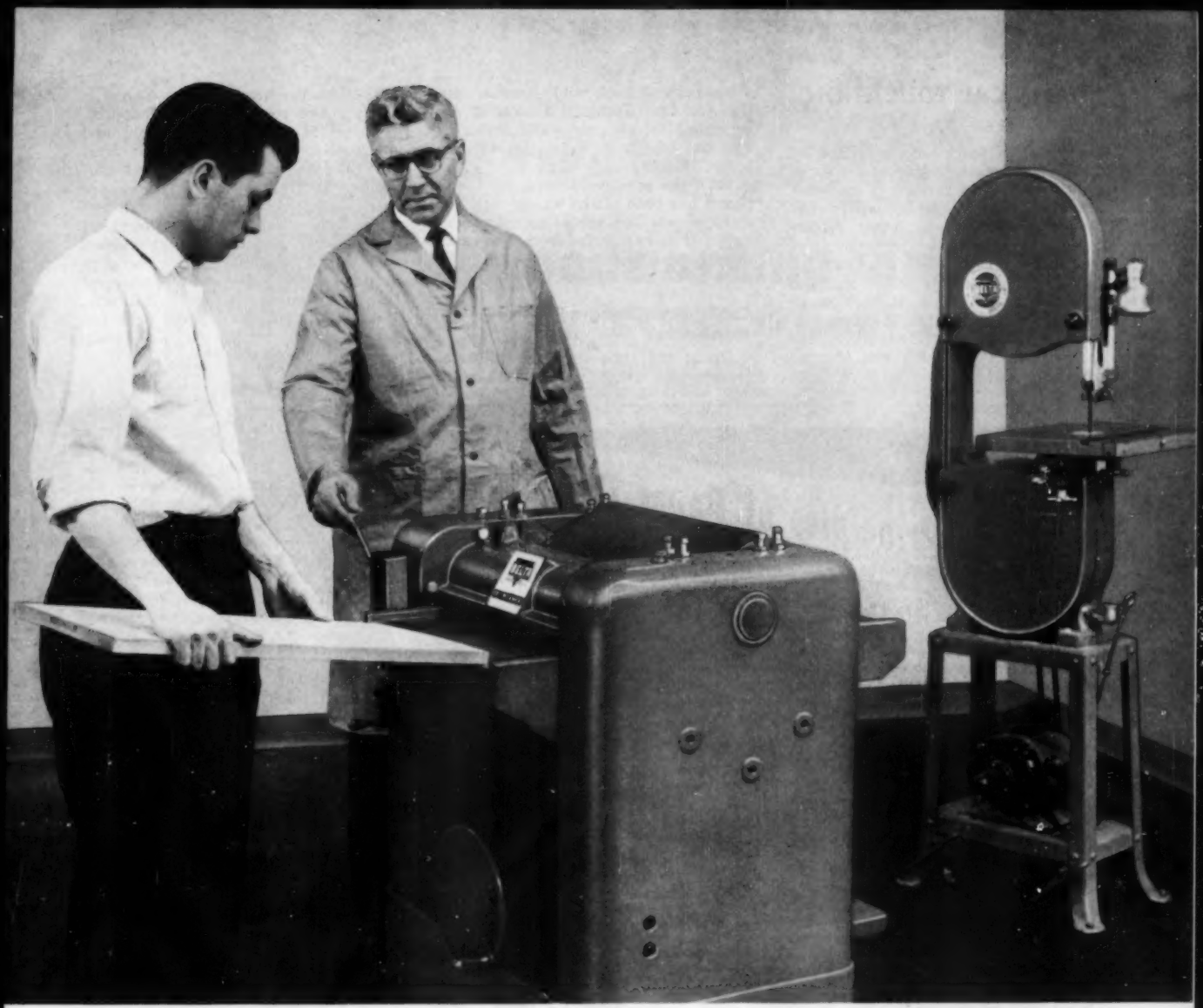

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TECHNICAL EDUCATION

(Continued from page 12)

the results of which were published by the U. S. Office of Education in 1944 in Bulletin No. 228 entitled, *Vocational-Technical Training for Industrial Occupations* — as well as other factors gave an impetus to the development of technical education. This was reflected in increased attendance at the technical education conventions. At the annual meeting in Miami, Fla., in December, 1950, in the interest of simplicity, the name of the Association was changed from the American Association of Technical High Schools and Institutes to the American Technical Education Association. This broader name indicated that the association covered a broader scope.

With the passage of time, more emphasis has been placed on the development of post-high school technical education. This is reflected in the increased number of officers from technical institutes and junior colleges.

Constitution Changes Relative to Membership

Up to 1957, the only type of membership was individual. At the annual convention in Philadelphia on August 6, 1957, a new constitution was adopted. It provided for life membership and membership for organizations or firms interested in supporting technical education. At the Chicago convention in December, 1959, institutional membership for schools offering technical courses was authorized. Beginning in June, 1960, institutional memberships started coming in from private technical institutes, public technical institutes, community colleges, junior colleges, technical high schools and vocational-technical schools.

New Office Created

The constitution which was adopted in Philadelphia in 1957 provided for a new office, that of executive secretary. The present incumbent served provisionally for three months before he was elected at the Buffalo convention in August, 1958. He has been re-elected annually. The Association recruited the executive secretary from the New York State Department of Education where he served 27½ years as Supervisor and Chief of Technical Education and was responsible for the promotion and establishment of a state-wide system of approved technical high schools and institutes.

Newsletters

With the establishment of the new post of executive secretary, the association began the publication of a newsletter. The first of these was issued on June 19, 1958. These Newsletters are issued bimonthly except during July and August. They contain a digest of current literature in the field of technical education. They are designed to inform A.T.E.A. members of the most pertinent and significant events and developments in the field of technical education.

ATEA Incorporation

In 1960 the regents of the University of the State of New York granted an absolute charter to the American Technical Education Association. The association is incorporated as a non-profit educational corporation. The following is taken from the charter: "The purposes for which such corporation is formed are: (*a*) To promote technical education for interested and qualified youth and adults; (*b*) To recommend standards for technical education; and (*c*) to provide an opportunity for an exchange of ideas among persons in the technical education field."

The board of trustees is the policy-making body. The four officers, the president, vice-president, treasurer and executive secretary are trustees. The officers are elected for one year and may be re-elected. The other nine trustees are elected for a term of three years and may be re-elected. The 13 trustees serve without pay and are dedicated to serve the welfare of technical education in general and the members in particular. Of the 13 trustees, six are engaged solely in post-high school technical edu-

(Continued on page 16)

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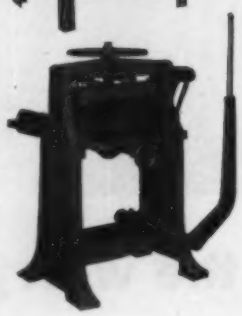

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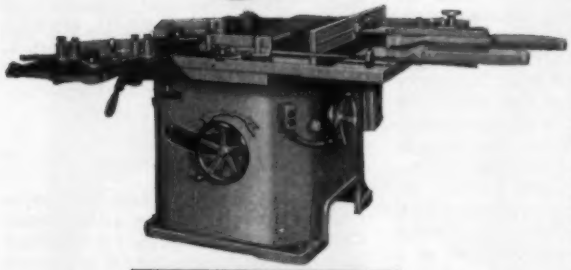

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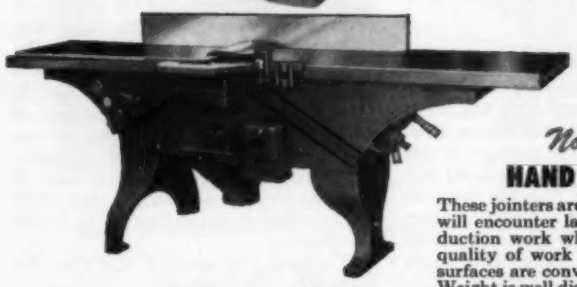

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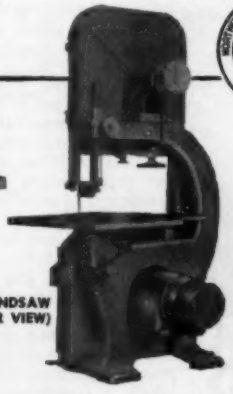

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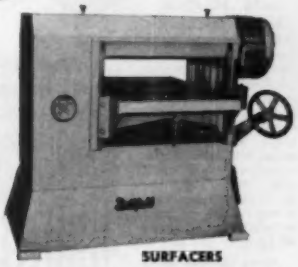

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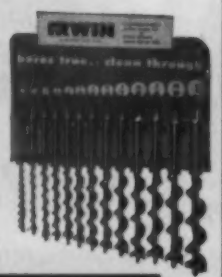

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TECHNICAL EDUCATION

(Concluded from page 14)

cation, two being presidents of private technical institutes. Three of the others are responsible for both high school and post-high school technical education. One is principal of a large technical high school, while the others are in state education departments.

Regional Advisory Council

At a meeting of the Trustees in October, 1960, new bylaws were adopted. These bylaws made provision for a regional advisory council of nine members. One is required to be from Canada. The states are divided into eight regions. One member is required from each region. The members serve for a term of three years. The first members were elected at the Los Angeles convention in December, 1960.

As the name indicates, members of this council are called upon for advice to the trustees. They also assist the executive secretary in securing members and in promoting state and regional meetings on technical education.

On the advisory council there are deans of junior colleges, state and local supervisors and directors of technical education, as well as a principal of a vocational-technical school.

Increase in Membership

The executive secretary began his work at about the same time that Congress passed the National Defense Education Act of 1958. The passage of this act, and the work of the National Science Foundation, the National Association of Manufacturers, as well as other organizations, served to create an awareness on the part of the general public of the importance of technical education. At the same time educators became increasingly interested in attempting to meet the needs for technical education. The association responded to this increased interest by expanding its services to members. All of this has been reflected in a 25 per cent increase in individual membership each year for the past three years and an increase in institutional membership for 1961 of 125 per cent compared to 1960.

Services to members include:

1. An international annual convention is held with outstanding speakers who discuss the problems of technical education and their solution. At least one of these speakers is always from Canada.
2. Copies of the A.T.E.A. convention addresses are sent to members.
3. The A.T.E.A. convention is held in the same city, just prior to the A.V.A. convention, so that one trip includes both conventions.
4. At least five significant and informative newsletters are issued each year. These provide members with selected information which it is difficult, if not impossible, to obtain without membership.
5. From the great mass of literature on technical education, selected quality publications are sent to all members.
6. Members receive the annual report of the executive secretary and a certified financial statement of the association.
7. Bi-annually, a membership directory is furnished to members.
8. The association provides consulting services on a wide variety of problems involved in establishing, expanding and improving technical education.

Institutional Member Service

Institutional members receive all of the eight services listed above. In addition, they receive selected professional publications which are too expensive to send to individual members or of which the supply is too limited.

Committees have been established for the purpose of supplying to institutions certain professional information not otherwise available. Currently, there are three committees at work: (1) Recruiting and Education of Teachers of Technical Subjects. (This is a joint committee with the National Association of Industrial Teacher Educators), (2) Recommendation of Standards for Technical Education in High School, and (3) Recommendation of Standards for Post-High School Technical Education.

Plans for Extended Services

Now that the association is incorporated as a non-profit educational organization to which dues paid are exempt from Federal income tax, it is planned to secure industrial membership. Receipts from such dues will permit the association to conduct an extensive program of research and development in such fields as curriculum, courses of study, equipment, student personnel policies, financing technical education, and supervision and administration. It is planned also to cover more extensively the training of technicians in the health occupations.

A program of research into desirable standards for technical education is planned. When recommended standards are based upon research and when recommended procedures for establishing technical courses are formulated, this will be of great service to institutions and individuals who are planning technical courses of high quality.

In brief, the American Technical Education Association, Inc. is the *one* organization which assists in the development of programs designed to increase the supply of well-trained technicians at all levels, whether the training is given in high school or post-high school, day or evening, whether given in public schools or private institutions. Just as we need team work in industry and the health occupations, likewise we need team work among educators. There is so much to be done in the training of technicians at all levels, that cooperation is urgently needed. There should be no internecine competition if we are to carry out our patriotic duties.

For More Information on A.T.E.A.

For further information about the American Technical Education Association, Inc., readers are invited to write to the executive secretary at 22 Oakwood Place, Delmar, N. Y. □

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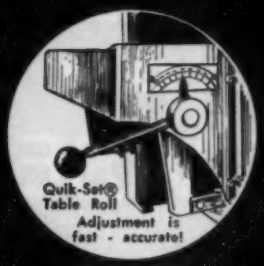

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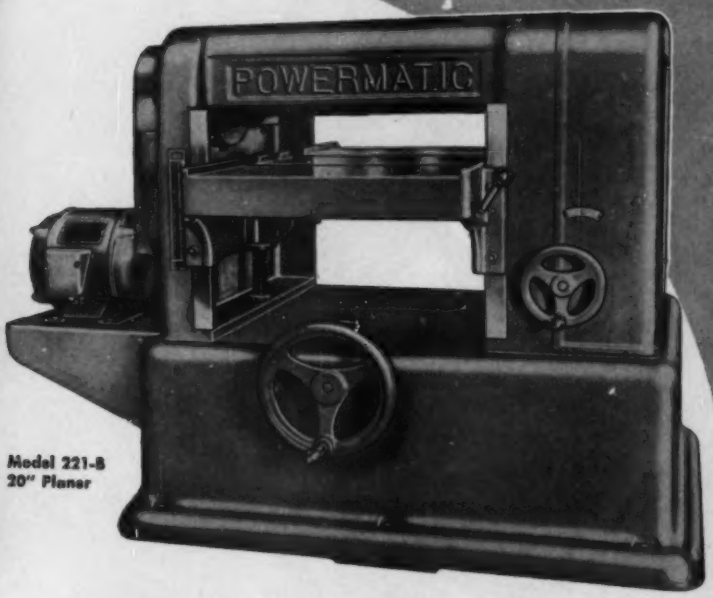

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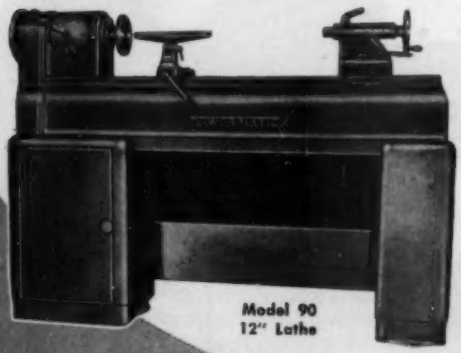

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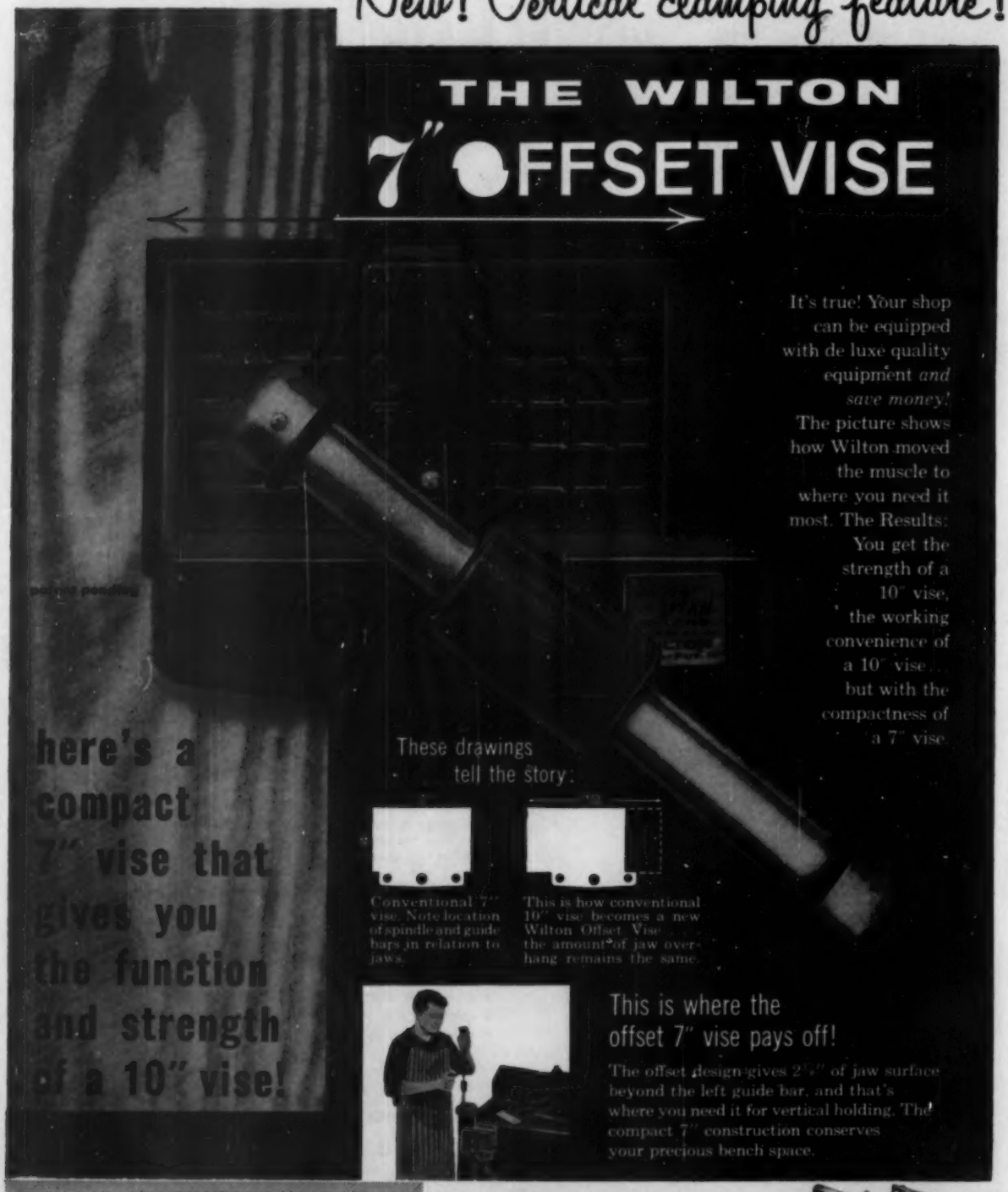

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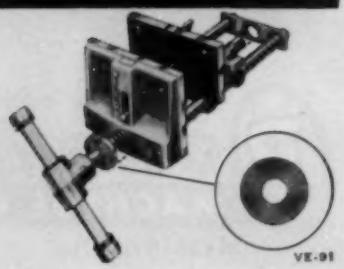

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the editor's stand

DOES INDUSTRIAL ARTS TEACH STUDENTS HOW TO THINK?

At a recent state convention of school board members, the general manager of one of the big three automobile manufacturers spoke on the subject, "Education for Excellence." He indicated in his speech that the major job of schools must be to teach students how to think. He also suggested that industry could take over much of the job of specialized training from the school. This move, he said, would help educators to do the job that they and they alone are equipped to do: the job of sparking the curiosity of their students, teaching them to develop the ability to make wise decisions, and opening up young minds for a lifetime of learning. In many cases, he says, vocational courses could be eliminated entirely from the school curriculum. He went on to say that by providing highly specialized training in the trades, schools are offering what frequently can be better obtained during a person's early period of actual employment. He indicated also that in this fast-moving world, specialized skills are frequently of only short-term importance.

What does all of this add up to? Certainly, many school board members will assume from this proposal that here is another good argument for eliminating industrial arts from the school program. After all, if the representative of one of the large automobile manufacturing concerns feels that shop training isn't important, then why should we have it in our schools? This then, brings us to the major question — does industrial arts help students to learn to think, or is this the prerogative of academic courses only? Is there no thinking in industrial arts? Is all of our work hand work? Most certainly not!

To Think in a Realistic Way

As one of our early leaders used to remark frequently, "There is no more brain in your hands than there is in the seat of your pants. Your hands are only tools of your minds, and you must think in order to use your hands effectively." Industrial arts presents the ideal opportunity for teaching students how to think. Here is one of the few places in school which reflects the four basic ingredients of life, i.e., the student working with ideas, with things, with other people, and by himself. We teach students to think in a realistic way.

It is too often assumed that an academic subject automatically provides students with the chance to think and to think critically. Your editor recently reviewed one of the most popular ninth grade books on mathematics. Certainly, no one questions the value of this subject and yet well over a third of the problems in this book are drawn from the industrial area. The only trouble with them is that they are not drawn from life. They do not require that the student have the true-to-life answer — only that the answer be right to give him a certain score on a test. Here, for example, is a typical problem:

"Jim builds a feeding station for birds. He uses a board 8" wide, the floor is 10" long, the roof is 1' long and the sides are 6" long. How long a board did Jim use?"

Does it really make any difference whether or not Jim gets this problem right or not, if he never builds the feeding station nor if he ever has the experience of laying out the length on an actual piece of wood? How can he possibly learn to think correctly, clearly, and accurately through the solving of this and similar problems? Industrial arts, on the other hand, provides this same student with the opportunity of actually working out the problem in a real life situation. Jim knows that if he doesn't figure his bill of materials correctly, he won't be able to build the feeding station at all. He knows that if he cuts it wrong, he has wasted his money. He knows that if the pieces are the wrong size, the project won't fit together. This is how we teach the students how to think. Not by giving them a series of artificial problems, the correct answer to which makes little difference. It is time that we speak up and let people know that we are actually teaching boys how to think in our classes.

How to Teach Boys to Think

Of course, we can't claim this honor if we aren't doing it. You must ask yourself these questions:

1. Am I using a textbook and reference material in which students can find the answers to their problems?
2. Do I require that the students fill out a bill of materials and figure the cost of their projects?
3. Do I require students to plan their work before they begin to use tools? Do we require students to be resourceful in developing their ideas and in carrying them to completion?

If we do these things, then we can claim better than any other subject in the school program that we are helping to teach students how to think. If we are doing the job we ought to be doing, we are helping to educate the student to be creative, to think critically about his problems, and to solve his problems in real life much the same way in which he has the opportunity to do so in his school shop experiences. □

John L. Feirer

Responsibility of the State Department in Improving Industrial Education

H. M. JAMES

□□□ *An important link in strong programs of industrial education is the director in the state department. Here is a delineation of his duties, with an outline of some of the services he provides for administrators and teachers in local school districts.*

It is obvious, I presume, to all of us as we achieve a greater national growth, that we must expand our education programs. In the years ahead, probably to a greater extent than at any other time in our history, the quality of our education will be a determining influence in our national strength and welfare. Our educational system, our industrial productivity, and our management of government affairs are challenged as never before to meet a national crisis at an historical moment.

Change and Education

Change is the keyword in interpreting the demands of the educational and training needs of tomorrow. National trends in industrial education emphasize the needs of people in a society characterized by fast technological change: automation, mechanization, urbanization, transportation, communication, world wide acculturation, migration, new occupations, new products, continued increases in governmental functions, etc.

Do these situations have import for industrial education? I am sure most of us would answer in the affirmative.

It is questionable that agreement could be reached upon many issues which associate themselves with industrial education, but let us assume that industrial arts is generally accepted as a part of the secondary school program and that the public secondary school has a responsibility to provide vocational-industrial and technical education that will meet the interests and needs of youth. This is a sound assumption, since the American high school is designed for all children and is our hope for the maintenance, the perpetuation, and the improvement of our American way of life.

Industrial education, as used in this treatise, encompasses both general and specific areas of instruction and includes industrial arts, vocational-industrial education, and technical education. Each of these areas in industrial education provides opportunities for students to develop attitudes, appreciations, skills, and understandings of our industrial and economic world.

Let us now take an objective look at factors, situations, and conditions that influence the implementation of industrial education in our schools.

The U. S. Department of Labor estimates that within the next ten years our labor force will be distributed approximately as follows: professional and technical occupations, 9.7 per cent; proprietor. managerial and official occupations, 8.8 per cent; clerical and sales occupations, 20.2 per cent; industrial occupations, 41.4 per cent; service occupations, 9.5 per cent; and agriculture, 8.3 per cent.

Labor Distribution and I-E

What are the implications of this distribution for industrial education? Regardless of what parents, employers, counselors or students think, the next generation of workers will be distributed approximately among the different occupational groups as predicted.

Most school administrators know this will happen, but some cannot accept the fact that it will apply to their school and to their students. The result? Disillusionment for a large number of high school graduates and the hard realization that an important segment of our society is made up of craftsmen, technicians, service workers, sales persons, and office workers, with only one in ten in the professions. Of the total labor force approximately 41 per cent are expected to be in industrial occupations.

Each year many thousands of youth and adults leave our schools. In Maryland, and this maybe is representative of the nation, approximately 11 per cent are graduates having 16 or more years of education, 11 per cent have completed one to three years post-secondary study and 38 per cent are high school graduates terminating formal education. This 60 per cent represents the holding power of the high school. The remaining 40 per cent are "early school-leavers" — 28 per cent of whom leave high school before graduation and 12 per cent of whom leave school before entering the 10th grade.

The 40 per cent drop-out group could decline during the next decade, if provision is made for programs in

Dr. James is director of the division of vocational education, Maryland State Department of Education, Baltimore.

education that are attuned to the needs of early school leavers. Furthermore, more high school graduates may undertake post-secondary study, if our colleges and universities can accommodate them. If enrollment in those institutions doubles, the percentage of students who complete a four-year degree program will increase about one per cent.

This picture more than justifies the need for strong programs in industrial arts, vocational-industrial and technical programs in the high schools — and the extension of these programs into grades 13 and 14. State departments of education can do much in giving positive support to the development and maintenance of such programs in industrial education.

State Responsibility

What is the State's responsibility for the development and maintenance of industrial education? Or perhaps I should say, what is the responsibility of the state department of education as the educational agent of the State?

A state department of education has, as a major responsibility, the creation and stimulation of better opportunities for learning. State departments may vary in the the extent to which they can or should assume leadership responsibilities, but there appears to be a general agreement that the following are important: (1) preparation and improvement of professional personnel; (2) basic instructional programs; (3) instructional and professional materials; (4) dissemination of effective instruction practices; (5) evaluation of instructional programs; and (6) emerging and experimental programs.

The state superintendent of schools is the educational leader of the state. As such he is responsible, with the assistance of his staff and other professional people throughout the state, for implementing the leadership, regulatory, and operational functions of the state department of education.

The administrative leadership responsibilities and relationships include planning, implementing, coordinating, and evaluating activities. Provision must also be made for adequate consultative services, effective public relations, and necessary research studies.

Supplementing and implementing these activities are the leadership functions exercised by the professional staff personnel.

Organized, responsible leadership is necessary to insure that the organization and future development of industrial education be in line with conditions and needs of individuals. This article will not attempt to identify positions with leadership responsibilities, but merely state that each has a contribution to make to the development of the program and that a unified approach in effort, properly co-ordinated, may be most productive in the development of a quality program.

It is necessary that those of us engaged in industrial education activities furnish leadership and interpret philosophy to our fellow administrators and to the citizens of our communities. Our critics are on the offensive. Since they are conscious of the need for improving education, they strike at subjects in practical arts and vocational education, not so much with a hope of eliminating them from the offerings but for the creation of a smoke screen to confuse issues. When people do not know the facts, they can jump to false conclusions and support actions harmful to their own best interests.

State supervisors of industrial arts and vocational subjects are in key positions to interpret the program. Job specifications usually refer to these assignments as administrative and supervisory in character, involving the co-operative determination of standards of school organization, instruction, and teaching facilities, and mutually accepted procedures for achieving these standards. Duties entail the responsibility for developing co-operatively with school superintendents, supervisors, and local school personnel programs of instruction in industrial education that are designed to meet the needs of the students in each community.

Services of the State Director

These responsibilities may be met through many types of activity, and they involve administrators and supervisors at both state and local levels, and principals, teachers, laymen, parents, employers, and workers in the community. This is not an easy task. It involves co-operative action and planning and the active support of our educational leaders. It must focus attention on opportunities for youth and adults and develop an attitude toward and an understanding of the contributions industrial education can make in the development of good contributing citizens to our society. The following are presented as examples of activities or programs that have been used effectively in supporting the implementation of industrial education in public schools:

1. Exercise leadership in the development of a desirable, comprehensive, and continuously evolving program of instruction.
2. Provide supervisory or consultative services to schools for the improvement of instruction.
3. Define what schools should accomplish in terms of individual, community,

(Concluded on page 63)

Dr. Fryklund: The Status of Industrial Education

□□□ *During the past several years, many educators and notables outside the field of education (including navy admirals, college professors, and business executives) have proposed changes about what should be taught in the high schools of our country. Almost invariably, these suggestions have stressed the language arts, the physical and social sciences, and mathematics — at the expense of industrial education.*

Many industrial educators have responded with strategy designed to revitalize facets of the field; what subjects should be taught, how these should be organized, and with what techniques they should be presented.

For a perspective of what has gone on before Sputnik, what has and should be happening since, and what the future holds for industrial education in general — and industrial arts in particular — we talked with Dr. Verne C. Fryklund, whose efforts in the field have spanned nearly half a century and who has just retired as president of Stout State College in Menomonie, Wis.

The interview was focused on the new approaches suggested recently by leaders in industrial education.

Q. Dr. Fryklund, in view of the concern of industrial educators for what is accepted as a declining emphasis for secondary level industrial arts, do you believe there is a need for drastic changes in subject matter and teaching techniques in the field?

"All subjects, in all areas of education at the upper levels, should be taught for 'keeps' . . . with the view that the pupil will apply these in life. . . ."

As a college president for 16 years I have had occasion to associate with legislators, taxpayers' groups, education and business leaders from this country and other countries, I have observed that the people in various areas of education seem to be quite remote from those who hold the purse strings and remote from the people who must raise the money for education. We educators can dream dreams of great satisfaction to us — idealistic things and seemingly worthy objectives — but we seldom are

in contact with legislators who are critical of education and watchful of its expenditures. There is a check on all expenditures that do not show value received in fitting young people to work in an increasingly complex society.

General education values, hobby values, disciplinary values and the like mean little to lay people. We are often considered — our area that is — an unnecessary appendage to the schools because we do not present to the taxpayers ongoing, acceptable reasons for existence. Young people in the upper levels of high school are assumed to be making ready to enter employment either directly or by way of higher education.

Q. What should be done, therefore, to impress the above groups?

All subjects, in all areas of education at the upper levels, should be taught for "keeps." Mathematics, science, shop, languages, under whatever inviting caption, should be taught with the view that the pupil will apply these in life after school in earning a living or in advancing this objective by way of higher education. No doubt you have heard of the large cities' program of senior high school education. It is as I have just described. There must be subject matter and good teaching. The various objectives will be attained if there is subject matter and good teaching. There are many concommitant values when there is good teaching.

Q. There are some leaders in our profession who suggest that industrial arts should be primarily a problem-solving experience, and that the students should learn the basic operations or skills only as they need them in solving their problems. Would you comment on this?

People who do things in the world are problem solvers; they overcome human difficulties. Problems, however, cannot be solved in a vacuum. An apperceptive basis is necessary from which to draw proper patterns of response. There are fundamental elements in all areas, whether music, mathematics, physics, or shop. These elements should become fixed in the nervous system — habits if you please — in consequence of good teaching and experience. In shop, there must be teaching of operations and information topics; otherwise, there will not be proper patterns of response when needed. Certainly there should be problems or projects as vehicles of training. The real incidence of problem solving in shop teaching, however, is in the making of the plan of procedure and its execution, and not in the discovery of proper performances of an operation or in the "use" of tools. The latter is dangerous.

Dr. Fryklund retires...

Dr. Verne C. Fryklund retired as president of Stout State College, Menomonie, Wis., on September 1. Culminating a career of over 44 years in industrial education, Dr. Fryklund has been a teacher and supervisor on the local district level and a professor and department director on the college level; he has written six professional books, many of which have been reprinted and translated extensively, and numerous magazine articles, bulletins, and manuals; he has received many presentations and citations, including the industrial arts "Man-of-the-Year" award during the 1961 AIAA convention.

Education

Dr. Fryklund was graduated from Stout in 1916. He received an A.B. from Colorado State College at Greeley in 1923, an M.A. from the University of Missouri in 1927, and a Ph.D. from the University of Minnesota in 1933.

Experience

He taught in the city schools of Greeley, Houston, Detroit, and Denver between 1917 and 1922. He was also curriculum supervisor of vocational education for the Detroit schools. He was a member of the faculties at Wayne State University and the University of Minnesota.

Dr. Fryklund's teaching career was interrupted by both World Wars. In 1916–17, he earned his sergeant's stripes in the 125th Field Artillery; in World War II, he received the Legion of Merit for setting up a training program for maintenance functions that improved the effectiveness of the nation's combat units. He also was assigned by the Department of the Army to reorganize certification and curriculum in vocational teacher education in Japan after World War II.

At Stout

During his 16 years as president of Stout, enrollment at the college increased from 500 to 1500. Six new buildings were erected during this period and extensive renovation of existing facilities was undertaken. In addition, the curriculum has been expanded to include a major in industrial technology and new opportunities in clothing and textiles, foods and nutrition, and technical writing.

Since 1941, Dr. Fryklund has been permanent chairman of the Industrial Arts Conference; he has served as chairman of the National Industrial Arts Accreditation Committee, as a member of the AACTE Regional Planning Committee, and as commissioner for the North Central Association of Colleges and Secondary Schools. He is currently a member of the armed Forces Education Advisory Committee.

In recognition of his many educational, military, and civic endeavors, he was named in 1953 by the University of Minnesota to receive the institution's "Outstanding Achievement Award" which cited him as "a gifted contributor to the theory and practice of industrial arts, vigorous champion of industrial education, renowned for meritorious public service in war and peace."

At a recognition dinner held by the Faculty of Stout for Dr. and Mrs. Fryklund, it was announced that the college's new industrial education building has been named "Fryklund Hall." In his address, Dr. Fryklund stressed the importance of all types of education to a free America, concluding with the prediction that "in the long run education will determine whether America will win its battle for survival with the Soviet Union." □

"...All the dreams and inventions of the great scientists can never materialize without the abilities represented in our kind of education. For every really able scientist, several hundred persons with mechanical competence are needed...."

Q. There are also those who believe that greater emphasis should be given to elementary research techniques of a practical nature for the above-average students in industrial arts? In this kind of program, students select different problems and try to work out solutions. (Here, again, no attempt is made to teach a common core of elements.) Do you believe it is possible to do this in industrial arts, while carrying on a more traditional program with the average and below-average students?

Yes, I believe there should be experimentation and research, but neither can be done in a vacuum; otherwise there will be puttering. There cannot be research in mathematics unless the individual has mastered mathematics. This applies in shops, also. The making of a plan of procedure is a junior engineering venture and has elementary research values. There should be variety in the shops in an effort to cope with individual differences and extra problem-solving ventures should be available to the above average students.

Q. In the organization of subject areas, do you believe the analysis technique is still the best method of arriving at subject matter content for all levels of industrial education (industrial arts, vocational-industrial, and technical education)?

Yes. There is no other way of delving into uncharted areas to determine what should be taught. There is little need for analyzing over and over again the charted and proved areas, but analysis should also be studied because it is very helpful in mastering teaching methods and in course development. The analysis technique has given identity and meaning to all shopwork. It will become more and more useful in industrial teacher education to those who want to be good teachers.

Q. If the analysis technique is used for arriving at subject-matter content, aren't we limiting our teaching program largely to the production trades (such as carpentry or the work of a machinist?) What about the service trades and the technical occupations?

The analysis technique is useful in all areas of education, not just the trades. It has been used successfully in analyzing hundreds of occupations whether they are trade, service, or technical occupations. I have directed the analysis of police work, clothing construction, playing of various musical instruments, football, optics, nursing, combat tank repair, grocery selling and a variety of other occupations. Analysis is an exceedingly important curricular research technique that should be included in industrial teacher education. People who have not studied it don't know its meaning and how useful it is. They have passed up an important professional technique.

Q. Do you think we are trying to cover too many areas in industrial education? A recent state publication listed 60 distinct teaching areas that were taught in at least one school system in that state. Can we do a good job at anything if we try to do everything?

This is a difficult question. There are some areas in industrial education that are basic and will never die even in automation, such as drafting, woodworking, sheet-metal working, machine shop, pattern making, foundry work, tool and die making, power mechanics, electrical work at various levels, and graphic arts. These are of world significance. Also, there are activities that are peculiar to a geographic area or country. At the moment, however, I cannot conceive of 60 shop areas of world and local importance that could be included in the offerings in the schools of one school system. The bulletin referred to may include all school offerings. If the 60 offerings are in industrial education, there must be many general shops and the city must be extremely large.

Q. This implies general shops have a specific purpose?

Unit shops serve best, of course, in large city high schools when large enrollments justify them. The smaller high schools, for economic reasons, find it necessary to offer industrial education instruction in general shops. The general shop teacher must be a jack of all trades, and especially trained to teach multiple activities, otherwise there is much puttering and little learning. The poorly qualified general shop teacher is a shop keeper and not a shop teacher. Six activities are just a little beyond what most good teachers can teach and teach well.

Just think of the many versatile teachers that must be employed in a system offering 60 different shop subjects! Most cities could not possibly support such a program.

Q. Some industrialists have expressed admiration at the objective of industrial arts to teach about modern industry but have stated that they are disappointed with the results. Can industrial arts really teach about modern industry in an age of explosively developing technology?

Modern industry is of all kinds, thousands of kinds. The school shop can provide limited experiences only in mass production and personnel organization. On the whole, this objective is quite ethereal.

Q. Will you give us a good practical final thought, President Fryklund?

Not many years ago, we timidly feared the term "skill" in shop teaching. We placed it at the end of a long list of objectives, or perhaps we didn't use it at all. But mathematics teachers didn't, English teachers didn't, music teachers didn't, science teachers didn't. But we did.

We hid one of our most useful objectives at the end of the list because we weren't sure, or we feared criticism, or we didn't know any better. We couldn't identify subject matter and we didn't respect it, but the traditional subject teachers could identify their subject matter and they still do and they are proud to do so and to teach a given subject for keeps.

We should teach the know-how of processing raw materials into finished goods whatever we choose to call our shop activities. There is subject matter in such offerings and it requires good teaching. The taxpayer seems willing to pay for education which results in attainment that has salable value.

All the dreams and inventions of the great scientists can never materialize without the abilities represented in our kind of education. For every really able scientist, several hundred persons with mechanical competence are needed. You see why we must teach for keeps in every educational area including shop? Shop instruction in the senior high school therefore should have salable value. That means skills — "know-how."

I have traveled a good deal and each time I return to the United States, I am more and more convinced that the United States has the best system of education in the world. There is opportunity for everyone in America and that isn't possible in most countries of the world. □

Questions for the Programmer of Space-Age Industrial Arts

WILLIAM J. MICHEELS

□□□ *To direct the development of industrial arts in the technological space-age ahead, there are certain basic and vital questions which must be asked.*

In a discussion* of the effects technology should have on industrial arts, there arise some specific questions which are intended to provide thinking and stimulate discussion for those who are concerned with a reappraisal and continuing development of industrial arts.

Among these questions, you'll find some disputes from the past, some variances of the present, and some conjectures into the future. Along the way you should raise many questions of your own, since these are not the only questions. In fact, they may not be the important questions — to you. They do, however, represent facets of the above challenge which should provide discussion concerning the improvement of industrial arts in the years ahead.

1. Is it true that present industrial arts education more aptly reflects the type of civilization from which we have come, rather than that toward which we are progressing?

2. Should industrial arts education start from a major premise of developing skills for skill's sake, or should the major emphasis be on understanding and using the basic principles relating to the use of tools and materials?

3. Should industrial arts concentrate on thing-making and tool-using or should major attention be given to experimentation and problem-solving?

4. Should industrial arts emphasize how-to-make-things or how-to-find things out?

5. Should an industrial arts teacher emphasize the acquisition of facts and techniques or should he be more concerned with the structure of the subject matter and its relationships?

6. Should there be a common or unified body of subject matter for industrial arts? Or, stated differently, how much uniformity should there be between the industrial arts offerings in different schools and different places?

7. Is most industrial arts simply a diluted form of trade training around which have been added glamour terms such as general education, interest in industry, co-operative attitudes and similar expressions?

8. Should an industrial arts teacher education program be expected to turn out teachers who can teach at any level, or should there be concentration toward a specific level: elementary, junior, or senior high school?

9. What can, should, or might be done if an industrial arts teacher were required to handle 40 or 50 students in each of his classes?

10. Would it not be better if we were to offer industrial arts as a non-credit service activity in the high school?

11. Would there be any value in calling senior high school industrial arts "Applied Technology," in the sense of being applied science and mathematics?

12. Is it improper for our objectives to include the development of abilities related to vocational proficiency?

13. To what extent, if any, should the learning experiences in industrial arts be related to the learning experiences in the other subjects of the elementary school, the junior and the senior high school?

14. What needs to be done about the articulation of industrial arts learning experiences? That is, to what extent do we find gaps, overlapping, or duplication of learning experiences from one grade to the next.

15. Have industrial arts teachers paid too much attention to what Johnny does to a piece of wood, and not enough attention to what the piece of wood does to Johnny?

16. What is the status of instructional materials for industrial arts? Are there any breakthroughs on the horizon?

17. What do we know about the psychological framework within which a typical junior high school pupil approaches problems relating to the use of tools and materials?

18. The term *design* continues to be a popular one in our literature. Should it be thought of as a teaching method, a process, a set of rules to follow, a form of problem-solving, or in some other context?

19. What would happen if a national decree suddenly abolished all industrial arts education in our schools? □

* Adapted from a speech by the author presented at the 23rd annual convention of the American Industrial Arts Association, St. Louis, Mo., April 6, 1961.

Dr. Micheels, former professor and chairman, industrial education department, University of Minnesota at Minneapolis, is president of Stout State College, Menomonie, Wis.

Industrial Education and the Public Image

LEONARD A. OSTLUND

□□□ *The prestige factor, applied to various areas of our curriculum, rates industrial education rather unfavorably. Here is a report of three studies of this negative public image with a list of suggestions of what can be done to counteract this situation.*

This article grew from the writer's conviction that social factors are partly responsible for the present industrial education teacher shortage. Specifically, it considers data concerning some emotional and prestige factors of the negative public image of the industrial educator.

The research for this discussion was encouraged by industrial educators, as well as by a recent issue of IA/VE, which contained an article concerning the decreasing challenge, interest, and enrollment in high school industrial arts courses.[1] Moreover, in the same issue, there were four letters asking for further research, and subsequent issues have focused on these problems.

It is interesting to note that France also faces industrial education difficulties of growth. In 1959, there were 378,000 students enrolled in technical education, an increase of 46,000 or 27 per cent. Therefore, 4000 new teachers and 5000 assistant teachers were hired and the equipment budget was increased 27 per cent.[2] Likewise, in the U.S.A., there is evidence that public, academic, and legislative support for industrial education programs has increased.[3] Recently several educational leaders discussed issues and presented future proposals in an article entitled, "The New Image of Industrial Arts."[4]

The term *public image* is popular as a replacement for the sociological term "stereotype" which is a loaded word. It means that each of us has a mental picture of people ("city slicker"), jobs ("white collar"), or nations ("Communist China"). This is useful, since it enables one to react immediately, automatically, and unthinkingly. However, it is harmful, erroneous, and misleading, for no single term could ever do justice to the wide variety of individual differences. Nevertheless, since it fulfills a desire to simplify complex data, the public image is here to stay — nourished by advertising based upon human needs.

However, if public opinion is to be changed, it is good common sense and standard research procedure to first find out the content of the public image. That is, as stated, the general goal of this discussion. Specifically, the purpose was to explore two dimensions — prestige and emotion. As an example of prestige appeal, look at the magazine ad in which a socialite in a Dior gown is pouring a supermarket brand of tea! As an example of an appeal to emotion, a *New York Times* headline read, "Nixon is Painting a Homey Self-Image."[5] The article explained that stories of childhood and an interest in sports — two important American cultural values — were stressed in the Vice-President's campaign, in order to engender favorable emotions in voters.

Obviously, confusion results when conflicting public images are presented. For example, *Life* magazine carried a photograph of the famous American scientist, Dr. James Van Allen, engaged in his hobby-woodworking. He was quoted as saying "Work with my hands frees my mind."[6] On the brighter side, a Cleveland newspaper published an article entitled "These Doctors Operate on Wood," which presented industrial education skills favorably.[7]

The fact that Americans attach differential prestige and salary to various occupations is indisputable and has been used by the writer for years in order to illustrate correlation techniques in psychology. When students have been asked to rank a group of occupations on these two dimensions separately, the industrial education has been ranked low consistently. "What else would you expect?" was the typical comment of IA/VE teachers. This led to the emphases in the present research.

Methodology

The data were obtained at a typical, public, midwestern university. Preliminary discussions and class assignments functioned as a pilot study. During all class discussions involved in these studies, the writer played a nondirective role. He did not agree or disagree, but

[1] Duffy, Joseph, "A New Look at Industrial Arts," *IA/VE*, Vol. 49, No. 4, Apr., 1960. pp. 14–15.

[2] *The Educational Movement in France During 1959–60*, Ministere de l'Education Nationale, Paris, 1960, pp. 6–7.

[3] Clarke, Andrew J., "Trends in Trade and Industrial Education," *IA/VE*, Vol. 49, No. 8, Oct., 1960, p. 56.

[4] Various Authors, "The New Image of Industrial Arts," *IA/VE*, Vol. 49, No. 7, Sept., 1960, pp. 26–27.

[5] "Nixon is Painting a Homey Self-Image," *The New York Times*, Sept. 18, 1960, p. 48.

[6] *Life*, Vol. 47, No. 26, Dec. 28, 1959, p. 79.

[7] *Cleveland Plain Dealer*, Pictorial Magazine, Apr. 24, 1960, pp. 40–41.

Dr. Ostlund is associate professor of human relations at Ohio University, Athens, Ohio, and was recently Fulbright Visiting Professor of Psychology in France. He has taught and counseled industrial education students.

TABLE I. Rankings of Industrial Educators

Rank Number	*Number of Subjects*
1	0
2	0
3	0
4	1
5	0
6	1
7	2
8	12
9	14
10	7
none	2
Total	N* 39
Mean Rank	8.54

acted as a moderator. He encouraged each to express his opinion and accepted everyone's statement regardless of whether favorable or unfavorable. The decision to use three different classes hinged on the assumption that, if one class were used, the first finding might bias subsequent investigations.

The subjects were men and women college students 18–25 years of age. They were studied intensively by means of techniques which the writer had used as Evaluation Director of a National Science Foundation Program.[1] These included group discussions and personal interviews, as well as content analysis of written assignments. Rapport was good and the answers were frank and complete. Their opinions must be considered carefully, for college students will be among the leaders of tomorrow.

Study I

The subjects were 39 college students who ranked high school teachers of ten different subjects according to I.Q. A mean rank of 8.54 was given to the industrial educator. Since a mean is an average, it was desirable to know whether it had resulted from a combination of high and low, or whether it was due to a trend of low ranks. The results in Table I indicated that the latter was true.

Only two teachers were ranked consistently lower, namely home economics and physical education. The majority of students ranked industrial educators in eighth or ninth place. Class discussions pointed out that this was what they had expected to find: the IA/VE teacher was less intelligent than his peers.

Study II

In order to understand the reasons for ranking industrial educators low in salary and prestige, two other college classes, a total of 59 students, discussed teaching in general. Later, they were asked to write an explanation, contrasting the industrial educator with other teachers.

The result was a total of 169 statements which were subjected to content analysis in terms of emotional tone — whether favorable, unfavorable, or neutral. For example, the statement, "He is a skilled craftsman who works with his hands," was judged as favorable. However, "He works with his hands because he isn't too bright" was judged as unfavorable. The statement "He is accepted better by some students than by others" was judged as neutral. Moreover, the results were tabulated according to the focus of discussion-teacher, student, or course.

The results which appear in Table II indicated that 66 per cent of the statements were unfavorable, 13 per cent were favorable, and 21 per cent were neutral. The fact that there was more concern about course and students than about teachers may have been due to the fact that the judges were students. Nevertheless, it was important to note the high degree of negative judgments, since there were about five unfavorable ones to each one that was favorable.

A descriptive compilation of the most frequently occurring negative themes would read as follows: "The course is easy, not important, and stresses manual skills." "Students who take the course are in the minority, they have a low I.Q. and are not college material." "The teacher has a low I.Q. and is not highly qualified."

TABLE II. Judgments Concerning IA-VE Teachers

Favorable Statements (N* 22 — 13%)
- Works with hands (N 6)
- Practical value (N 7)
- Miscellaneous (N 9)

Neutral Statements (N 36 — 21%)
- Works with hands (N 20)
- Miscellaneous (N 16)

Unfavorable Statements (N 111 — 66%)

Concerning the Course (N 48)
- Easy (N 12)
- Not important (N 11)
- Stresses manual skills (N 10)
- Miscellaneous (N 15)

Concerning Students (N 47)
- For students with low I.Q. (N 31)
- For a minority of students (N 7)
- For noncollege students (N 4)
- Miscellaneous (N 5)

Concerning the Teacher (N 16)
- Has a low I.Q. (N 7)
- Not highly qualified (N 4)
- Miscellaneous (N 5)

TABLE III. Sex Differences in Stereotypes of Industrial Educators*

	Men	*Women*	*Total*
Total Students**	11	22	33
A. Areas of Difference:			
Family and Home Characteristics	2	24	26
University and Work Background	1	11	12
Personality	8	39	47
Professional Relationships	6	21	27
Appearance	21	68	89
Total....	38	163	201
B. Areas of Similarity:			
Student-Teacher Relationship	16	45	61
Attitudes Toward Job and Student	6	16	22
Reputation and Importance	3	6	9
I.Q.	7	15	22
Interests and Hobbies	11	19	30
Total....	43	101	144
Total of each sex separately	81	264	
Combined total of both sexes			345

Study III

After obtaining judgments of low rank and uncomplimentary contrasts, our goal was to discover what aspects of the industrial educator — as a person — were the main concern of men's and women's opinions. Therefore, 22 women and 11 men in another class were asked to write a description entitled, "The Typical IA-VE Teacher." The question was given without warning and without explanation, in order to obtain maximum spontaneity. The data appear in Table III, and as in the previous table the totals represent statements, not students.

Table III highlights the importance of female opinion. Concerning the number of statements, a ratio of two-to-one might have been expected because there were twice as many women as men. Instead, the ratio was over three-to-one. While there are many possible reasons for this, the writer would suggest three which are based upon American cultural patterns.

* N Students 39

[1] Leonard A. Ostlund, "Science Teachers Evaluate Science Teachers," *School Science and Mathematics*, Vol. 58, No. 2, Feb., 1958.

* N students 59, N statements 169

* This table has been arranged so that the first item named, Family and Home Characteristics, represents the greatest sex difference in relative number of statements. The last item, Interests and Hobbies, represents the least sex difference.

** N Students 33, N Statements 345

(Continued on page 60)

Studying Industry Firsthand

JOSEPH W. DUFFY and JERRY STREICHLER

□□□ *Field studies for teachers and students: how to "keep up" with industrial developments to interpret them in I-E courses.*

Industry is changing rapidly. Its organization, its methods, and its products are continually and dynamically evolving. Major industries of the past decade have been eclipsed by new companies whose products, in many instances, were unforeseen or regarded as novelties ten years ago.

It is paramount that those engaged in the areas of industrial education be capable of interpreting contemporary industry.

How can the teacher keep up with the dynamic entity called industry? How can he bring to the student the reality of the action, the noise, the heat, the power, the discipline, the enterprise, and above all, the human endeavor which pervades the American industrial scene?

The school shop should be the principal agent through which industrial organization, processes, and materials become meaningful to the student. It is urgent that the comprehensive study of the industrial complex be undertaken with a vigor unmatched in industrial education in order to meet the demands of our culture and better prepare students for the future. Yet, there is a lag between educational content and the industrial reality because our educational system is limited by its financial structure and the natural time lag caused by the teacher-training period.

The solution to the problem lies with the teacher. He must be cognizant of the dynamic advance of industry. He must desire to impart this vital knowledge effectively to his students.

To do this job adequately he must employ such organization, tools, materials, and fabrication techniques that can properly portray industry in the shop. Instructional or visual aids reinforce and supplement the work in the shop as does the properly planned industrial excursion. In the latter case the student not only sees but is stimulated in every way. A visit to a steel mill will include the smell of the coke as it is quenched, the feel of the tremendous heat as a huge ladle passes overhead, the sense of excitement and danger as the molten steel is poured, the marvel of the rolling mill, and the noting of the demands and pressures imposed upon the worker.

Dr. Duffy and Mr. Streichler are members of the Industrial Arts Department, Montclair State College, Montclair, N. J.

The following is a report of a field studies course developed at Montclair State College. The objectives of the course, already implied in the preceding introduction are:

1. To provide future industrial arts teachers with meaningful group experiences through day-long visits to regional plants of some of the largest or most representative industries.
2. To emphasize the value of such visitations throughout one's teaching career.
3. To make the potential teacher aware of the plants in his locality which he could visit in order to increase his knowledge of industry.
4. To develop judgment and a critical sense of industrial organization, safety procedures, production methods, and labor relations.
5. To judge the educational merits of a field trip in relation to current schoolwork, its potential interests and level of understanding with respect to the public school student.
6. To develop an awareness of the responsibilities and liabilities involved in organizing and teaching such a course.
7. To indicate how field trips could be structured on any level of education so as to provide students with a truly worthwhile educational experience which would justify the expenditure of time, funds, and energy.

A selection of abstracted reports of trips which were arranged by the instructors for the field studies class are provided in the hope that these examples would stimulate the reader to reflect on those industries in and around his locale that could provide useful information and add to the industrial education program.

Esso Research Center

After a briefing and viewing a film which depicted the purpose of the research center in Linden, N. J., the group witnessed experiments in laboratories devoted to producing better rubber, plastics, and waxes, and to the generation of electricity by burning oil. Of particular interest was the experiment which tested gasoline and oils in modern cars under actual driving conditions. This was done by mounting several test cars on individual treadmills and controlling their starting, stopping, and speed by a magnetic tape. The tape was made by another car driving parkways, turnpikes, freeways, city streets, and cross country in order to achieve a typical driving situation. At the completion of the simulated trip, the engines of the test cars were dismantled and inspected for deposits and to determine lubrication effectiveness.

The refinery adjacent to the research center was also visited. Here the students were introduced to the chemistry of oil and to the means used to meet the demands of society by the proper refining, cracking, and distillation of crude oil. The huge cat crackers, distillers, and miles of oil storage tanks provided an interesting look at big business and industry.

United States Steel Corp.

There is no doubt that steel making is big industry. United States Steel's Fairless Works is one of America's largest integrated modern steel mills.

Excellent motion pictures on steel making are available, but a hundred movies could not convey the true picture of a steel mill. To actually grasp its massive size, in this case almost 4000 acres of land, to smell and see the coke as it is quenched, to see and feel the tremendous heat and light as the open hearth furnaces are charged with molten iron brought in huge ladles on flat cars from the nearby blast furnaces, to stand beneath these ladles as they pass overhead supported by two of the largest cranes in the industry — these are sensations no movie could impart.

Also thrilling is the rolling mill where a slab of steel six to ten ft. long tumbles out of a soaking pit onto the 80-in. mill. The heat from this slab makes the observer's face burn as it travels through several stands of rollers which successively make the slab thinner and wider until it comes out as a sheet of steel one fourth of a mile long traveling at a speed in excess of 30 miles per hour.

Eutectic Corp.

Eutectic manufactures low tempera-

ture welding supplies in Flushing, N. Y. After a brief informative introduction to the principles, operations, and processes involved in employing the technique of low temperature welding, the manufacturing plant and the warehouse were visited. The class observed the chemical mixing of fluxes, their application and baking on to the electrodes, and inspection and packaging.

This trip was equivalent to a one-day seminar in the technique of low temperature welding. Each student left with an understanding of the processes and principles which are involved in joining cast iron or steel, cast iron to steel, aluminum to aluminum, stainless steel, and the myriads of alloys in the ferrous and nonferrous families. All who made the trip were anxious to employ their newly acquired knowledge upon returning to the college's industrial arts laboratory.

— U. S. Steel Corp.

Guide-Kalkhoff-Burr

Guide-Kalkhoff-Burr is one of the largest job printers in the New York metropolitan area. This visit permitted the students to observe many operations involved in a large printing concern. They followed a typical order through the plant and noted layout, cost estimation, stock selection, paper cutting, lock-up, printing, binding, packaging for shipment, and billing. Many classifications of workers and their responsibilities; the superintendents, department foremen, storemen, typesetters, proofreaders, and so on, became real instead of just so many word symbols found in a text or seen in a film. Multicolor printing was observed firsthand and was one of the many processes which were observed and which are important aspects of the great American printing industry.

Reaction Motors

In the very small, and once quiet, New Jersey community of Rockaway the group visited one of the test areas of a company employed in making reaction engines for the United States government. Most of the work was classified and was covered by a veil of government restriction. However, it was possible to visit the various test pads and the main instrument center for the area. The employment of electronic devices and the information they recorded were particularly intriguing to the observers. The highlight of the visit was a static test of the reaction engine which powers the experimental X-15 rocket plane. Although this test was conducted some distance away in a concrete shell on the side of a hill, the students were able to watch the fueling operation. They heard the actual count down, saw the fiery exhaust and heard the thunderous roar of the rocket engine. The plant superintendent, who acted as the guide at Reaction Motors, informed the future industrial arts teachers of the thrusts, speeds, efficiencies, and temperatures connected with reaction engines.

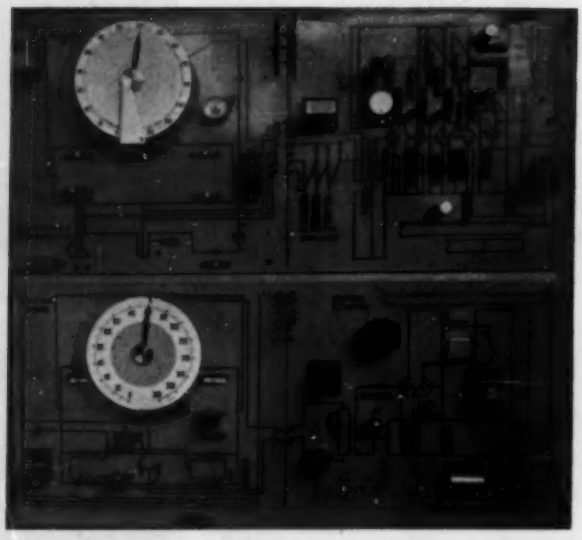
Unifying the Experiences

The preceding summaries are but a sampling of extensive reports produced by the students. The class was divided into committees of three. Each committee was charged with the responsibility of writing a complete report and evaluation and a letter of appreciation to the industrial host for one trip. These assignments were edited by another committee and the class then cooperatively printed and bound the reports which became a history of the course. Each student received a copy as did the appropriate representative at the plants which were studied. This provided an opportunity of further extending the group's appreciation for the time and effort which were expended in the group's interest, and strengthened the public relations aspect so necessary in this type of program. In this way, the primary objectives of the field studies course were met. The orientation, the visits, and the write-ups provided a unified experience. □

. . . and individual visits to small plants

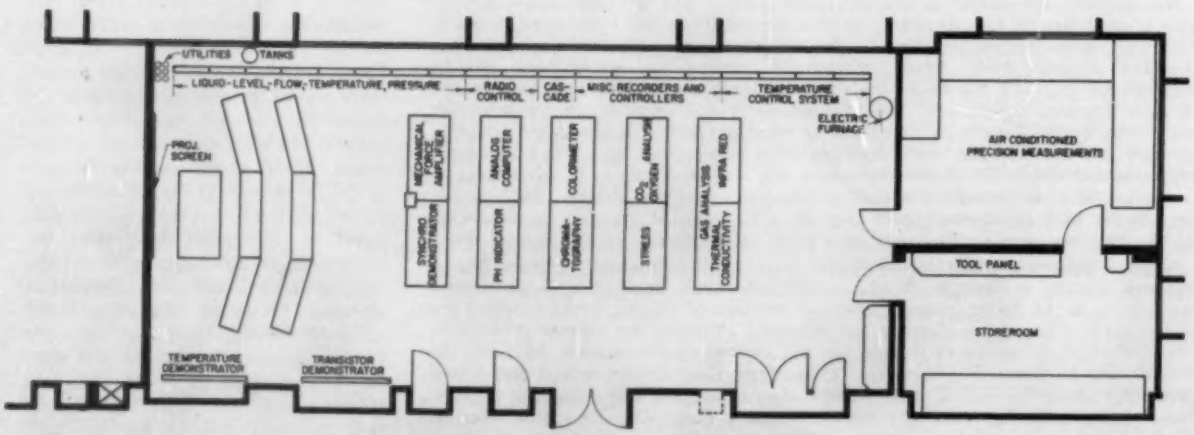
To complete the course as planned, each student was required individually to visit a *small* plant in his community or in a community in which he hoped to teach. This assignment focused attention on the important aspect of planning, contacting company representatives, letter writing (to confirm an appointment and to acknowledge gratitude for hospitality extended), and an individual analysis of the industry segment represented. This assignment also reinforced the concept that such trips by *individuals to small plants* were not only feasible when properly planned and executed but were desirable since small shops and plants are more prevalent and widely distributed throughout the state and nation. In some areas of the nation they are the only examples of industrial enterprise. Further, the idea that the teacher in a community could keep up with technical progress through visits of this type was quickly recognized as a result of the success of this assignment.

Typical individual visits included trips to: (1) Weyerhauser 4-Square Manufactured Homes in Newark, N. J., a relatively small plant of a large concern specializing in the design, manufacture, and erection of pre-cut homes — where the visitor could observe the planning and designing of homes for volume production, the production techniques employing jigs and fixtures, quality control, etc.; (2) the Passaic (N. J.) Photo Engraving Co., a four-man plant serving general commercial printers — where the visitor could observe copying camera work, negative preparation, coating, exposing, etc.; (3) the McWilliams Forge Co., Inc., of Rockaway, N. J., a firm doing industrial forging — where the visitor could observe the drop hammers and upsetting machines in operation, along with the laboratory metallurgy work. □



Above is an over-all view of the instrumentation laboratory at Murrell Dobbins; closeups of typical equipment are shown at the right. Below is a view of a teacher and students engaged in work-station experimentation.

A High School Course in Instrumentation



Above: floor plan of the laboratory. Right: a schematic of the simulator for flow, pressure, level temperature.

□□□ *A new instructional area with implications for all phases of industrial education.*

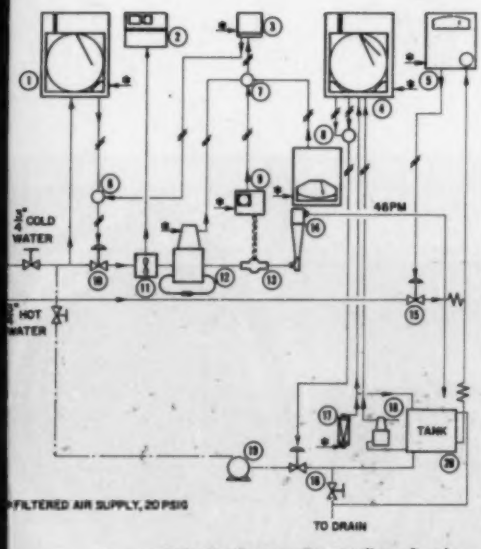
The instrumentation course in Philadelphia's Murrell Dobbins Technical High School is providing training for qualified students presently in the twelfth grade. In addition, four evening classes are currently in operation for upgrading those employed in industry making use of instruments, automatic controls, etc.

The objective of the day course is to provide the theory, skills, and experiences necessary to qualify young men for employment as semi-professionals in industry.

The course outline follows the suggestion given in the new "Basic Instrumentation Lecture Notes and Study Guide" published by the Instrument Society of America, with the measurement laboratory making use of Stouts "Electrical Measurements."

Mr. Lipp is school co-ordinator of the Instrumentation Advisory Committee of the School District of Philadelphia.

L. J. LIPP



1. pres. R.C.; 2. direct reading totalizer; 3. min. R.C.; 4. level, R.C.; 5. temp. indic. C.; 6-7-8. air switches; 9. air switches; 10. uniflow valve; 11. turbine meter; 12. low flow trans.; 13 mag. meter; 14. var. area trans.; 15. uniflow valve; 16. uniflow valve; 17. purge meter; 18. level trans; 19. aurora pump; 20. cylindrical tank.

Since the course necessarily must be partially governed by the equipment available, we are listing some of our materials.

Temperature

The measurement, control and/or recording of temperature is basic to both domestic and industrial use, therefore of major importance.

Our industrial advisory committee was asked for a list of equipment that would permit the simulation of temperature and associated ramifications. The committee has given us an installation which meets our needs. It includes:

1. Electric Furnace which is both manually and automatically controlled.

2. The furnace has four modes of thermometry: (*a*) thermocouple, (*b*) radiation, (*c*) resistance, and (*d*) expansion bulb.

3. Each of the sensory units records the temperature of the furnace on its individual recorder which is mounted on a standard 24 by 72 metal panel.

4. The four recorders are also controllers; they operate by signals to their respective units which are: (*a*) air controller variac, (*b*) motor driven variac, (*c*) mag amplifier and saturable reactor, and (*d*) contactor.

5. To allow for individual use of each sensor and control panel, a selector switch together with an indicating bulls eye and associated relays have been installed.

The above forms a complete industrial-type installation. We have secured additional equipment which permits the calibration of the furnace temperature. It includes: an optical pyrometer, a K-type potentiometer, a galvonometer, a standard cell, and a thermometer bridge.

The temperature industrial simulator demonstrators, for temperature measurement provide thermoelectric thermometry, resistance thermometry, radiation and optical thermometry, and filled system thermometry.

For automatic control through the Electrical Process, the equipment includes proportional adjusting, single action; duration adjusting, two action; current adjusting, three action; magnetic amplifier, saturable core reactor; pneumatic variable transformer; manual variable transformer; and precision calibration techniques.

The temperature simulator was purchased in units and assembled and wired by the school (However, our recommendation would be to purchase it as a system). Since the recording and control units are complex, and come in small packages, it is difficult for simple presentation. Leads and Northrup designed a demonstrator which "bread boarded" the complete process as it functions in the foregoing simulation of thermocouple sensory, recording and control through the contactor.

This unit demonstrates: thermoelectric thermometry, potentiometer circuitry, OHMS law, electronic detector circuitry, two phase motor principles, Wheatstone bridge circuitry, electric process characteristics, and precision calibration techniques.

Flow, Pressure, Level Temperature

This is one area where we were "ambitious." Instead of installing a unit to demonstrate each of the above, we included four flow units, four level units, three pressure units, and three temperature units. While the units simulate the methods employed by different manufacturers, the troubles and vexations encountered in connecting the various hardware, piping, electric work, etc., bring us back to our earlier suggestion of securing the system complete. We believe the optimum installation for good presentation would include: two 50-gal. tanks, one pump, and four panels for record and control level, record and control pressure, record and control flow, and record and control temperature.

When cost is a factor, the temperature panel could be eliminated from the flow, the level system in general is considered or the temperature panels.

The three panels would provide for measurement with: heat and area meters, positive displacement meter, liquid and solid level transducer, vacuum measurement, strain gage and electrical transducers, mechanic pressure transducers, pneumatic controllers and activators, sizing and characteristic of valves and pumps, and precision calibration techniques.

Two pneumatic systems of the miniature type were included, these demonstrate ratio and cascade.

Other equipment includes: humidity and temperature recorder, gas analysis, flame out, strain gauges and indicator, and multi-point recorders.

The precision laboratory equipment includes: potentiometers, decade resistor boxes, decade capacitance boxes, galvanometers, Wheatstone bridge, slide wire bridge, Kelvin bridge, Mueller bridge, impedance bridge, force amplifier, null detector, analog computer, digital voltmeter, tektronix scope, servo demonstrator, transistor demonstrator, R. F. induction heating, standard cells and resistors, colorimeter, and micrometers.

Also the usual laboratory equipment of meters, scopes, generators and mechanical measuring tools are provided.

The precision laboratory has been set apart from the main laboratory and is to be humidity and temperature controlled. □

Modern Art and Design in Industrial Education

E. A. LEMKE AND R. L. RITTER

□□□ *As an aid to the industrial educator attempting to incorporate the principles of good design in activity situations, the ideas of the "Brauhaus" represent a unique approach for implementation of functional design objectives.*

To state the problem is almost too simple: technological advances since the industrial revolution have systemized our society, inhibiting individual freedom of expression and sapping the aesthetic appreciation nurtured by this activity. The result of this coercion has been an appalling decline of aestheticism in our contemporary society. Had it not been for the efforts of an elite group of European craftsmen, this condition would be much worsened. For in 1914 in Wiemar, Germany, an able group of artisans dedicated themselves to the task of synthesizing art and technology in mass production. Though the school which they promoted, operated for only a few short years, the ideas of the "Bauhaus" represent a unique approach for implementation of functional design objectives.

Today, the exploitation of aesthetic design by many leaders of industrial education poses a problem of implementation for those who recognize the merit of such a movement but to whom the term *design* connotes a very esoteric intangible. Just as at Wiemar, art can serve as the expedient for the solution of this problem.

Mr. Lemke is assistant professor and Mr. Ritter is assistant professor and director in the department of Engineering Graphics, College of Engineering, Marquette University, Milwaukee, Wis.

Basic Concepts

To those who have but a limited knowledge of design, the basic concepts of form, line, and space are but quasi-meaningful. Comprehension of these rather abstract terms may for a time be circumvented by more common terms, i.e., problem solving, brain storming, or such fundamental guideposts as simplic-

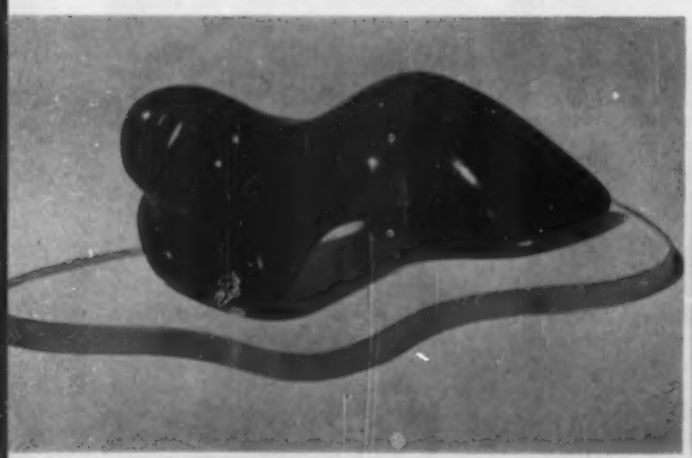


Figure 1. "Infancy"

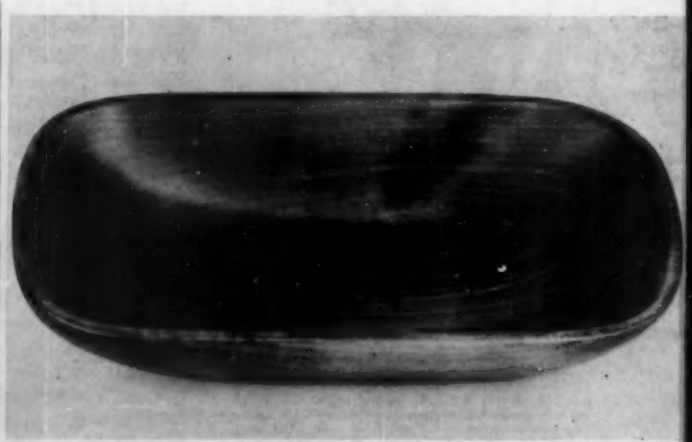


Figure 2. A functional study of the tactile form.

ity or functionalism. (These can serve as valuable aids to a cursory understanding and implementation; however, they tend to produce a rather vague appreciation.)

The requisite for any study of design is the development of a philosophy, perhaps the most universally accepted fact being "form follows function." The inference here is that form and function are separate and distinct entities to be unified creatively for each design effort. The latter phase of this endeavor, function, can be effected by various techniques. Inasmuch as this is to be a unifying process, however, one must be simultaneously conscious of form.

Form is that aspect of design or art which considers significant visual relationships, i.e., balance, rhythm, mass, etc., and the appreciation of which must precede any conscious design effort. A study of art will foster this appreciation, nurture latent talent, and suggest innumerable ways for implementing design in many areas of the industrial education curriculum.

Examples of Art-Centered Design

Inasmuch as we are proponents of an art-centered design course, the following illustrative exercises are submitted for your perusal. August Rodin's experience in contemporary sculpture led to the philosophy that "A thing can be beautiful only if it be true (to the material from which it is created)."[1] Figure 1 is a biomorphic creation, the tactile or touchable quality of which exemplifies the student's appreciation for honest use of material, and suggests an extremely effective exercise: the tactile form.

Infancy, a product of our sequence of instruction, is an abstract representation of the title. The interpretation of the student, Duaine P. Bernard, follows:

The highly polished walnut with graceful flowing grain structure represents the smooth, soft skin of an infant. The negative area represents absence of thought or use of reason. Arms are clapsed as a jesture of security. Arms and legs depict the incapacity to function. The clear plastic base signifies sanitation and a complete absence of substance, thus focusing interest on the main object.

A more functional use of the tactile form might manifest itself in the bowl (figure 2) and finally into an appreciation for honest use of material in any design effort. However, such experience should be preceded by a basic appreciation for tactile quality.

Piet Mondrian, striving for a universal art, published a manifesto, which suggested the synthesis of functional structural elements and design principles as a dynamic entity. To Mondrian all elements existed as space or mass. Mondrian's interpretation of mass involved the use of horizontal and vertical lines and the primary colors red, yellow, and blue. With these elements and space existing as ground, Mondrian strove for rhythm and occult balance, thus achieving a unique study of form. As such it suggests a tangible means for implementing the design principles in industrial education.

Figure 3 is illustrative of a student's response. Implementation of a "Mondrian" can take many forms, i.e., wood, Plexiglas, metal or, as seen here, india ink and tempera. However, any effort should be preceded by serious contemplation and sketching to determine the most unique solution for effecting design principles.

The impact of Mondrian's work is apparent in many areas of contemporary design, perhaps the most significant being in architecture. Here the manipulation of structural elements according to neoplastic principles produces a unique visual harmony, and a style which, because of its economic feasibility and adaptability to contemporary materials, has permeated the architecture of this era. A simple comparison of Figures 4 and 3 will attest to the influence of neoplasticism in contemporary architecture.

Art Study for Project Design

We have all experienced the frustration of attempting to foster original ideas in students who have already developed fixations relative to given projects. A study of the biomorphic forms of Henry Moore or Constantin Brancusi might suggest a unique approach to a freeform coffee table; the work of Piet Mondrian an innovation relative to a contemporary bookcase; the space modulators of L. Moholy Nagy, a welded room divider.

All are studies in visual harmony. As such, these projects represent original ventures in creative design fostered by an introduction to the basic principles of modern art. □

[1]Read, Herbert, "The Philosophy of Modern Art" (New York: Meridian Books, 1955), p. 22.

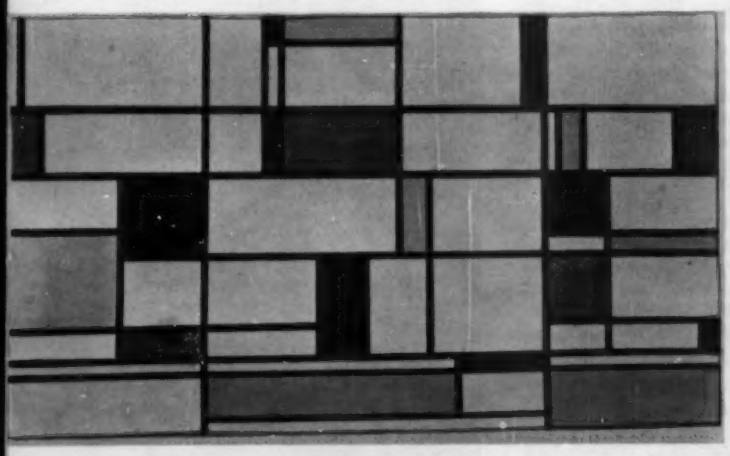
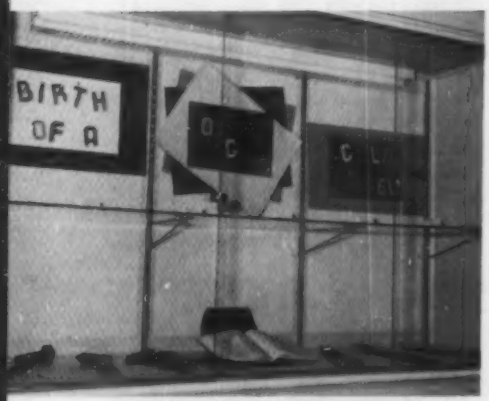


Figure 3. A student's response to neo-plastic composition.

Figure 4. An illustration of the neo-plastic principles in contemporary architecture.

The Lost Display Case

GERALD M. MUGERIAN



"Birth of a Cold Chisel": a step-by-step development of this tool.

"Tools of the Foundry": a variety of projects with the tools used to make them.

"The Web of Design": a variety of general metals projects.

□□□ Ideas on how to use the often forgotten, but still very valuable public relations device — the display case. It's "one of the finest mediums you have for visual expression!"

The most important sound or sight, is that of a person's own name. When a person hears or sees his name or a friend's name in print, you will at that moment have 100 per cent concentration. If you connect that name with an object that you want people to see and know about, you again will find 100 per cent success in the technique or method you have used in the association of the two.

Mathematics and science have taken the spotlight in the field of education to a greater degree than any other subject in the past few years. Where does that leave industrial arts? More than likely in a position where more than ever before it must show people that here in our field is where a good percentage of the facts and figures learned in the classroom are applied in actual practice.

Yes, we know this, but do other people? How can we tell them? Perhaps one of the most effective ways is by utilizing the space provided by most schools to display the work of the students in various projects, with a simple step by step or brief message in accomplishing the completed work.

A new school year is just beginning. The department chairman can be very effective in the motivation of this effort to display the material from the various areas of industrial arts classes.

First of all find out when the most important events, such as open house, PTA teas, father and son night, etc., are taking place in your school. Make reservations to use the display cases during those times. (This is extremely important.) Make out a roster with each instructor's name, indicating when he will have his opportunity to promote his area through the display case. Encourage your instructors to be as original as possible in their displays. Make them different and attractive. Ask your art department for some ideas. In fact, this method represents a means to tie in closer to the other fields of education. Make it a project with the art department chairman. Give them a little recognition too, they'll love you for it. They can let the students in their classes design the case, and work with the shop instructor in creating a very attractive display.

(Here is what I have done. I let the art teacher know — always in advance — what I planned to display in the way of the objects or the idea that I wanted to put across. For instance, "the development of a cold chisel," was one display I used. The art teacher then assigned the problem to a few of his more advanced students, or sometimes made it a class problem. He then selected the best ideas and left the final choice up to the shop teacher. When the shop teacher made his decision, the winning boy had the opportunity to work with and help supervise the job of putting the display in the case.)

What do we gain by a plan of this kind? Recognition. Yes, recognition all over the school. Other departments are now not only looking at and appreciating their own work, but yours too. It's like a chain reaction. People start smiling all over, and pretty soon one begins to see the practical and real purpose of the industrial arts program in the school curriculum.

Do you wonder how many people look at your display? Here is a good way to find out. If your display consists of a number of different articles, use the school bulletin to announce that you will give any student a free ice cream bar (or something of the sort) as a prize for being able to tell the instructor from memory all the articles shown in the display. Youngsters love competition. Here's a way to let them have it, and to learn what you are doing.

If in one of your department meetings you take and discuss this article, and other ways and means of shouting about your department's activities, you'll be surprised at the number of interesting ways you'll find of promoting your classes. Try "brain storming" sometime. Big business uses it, why not you?

To be heard, one must be seen. And one technique of this is to use the hall display cases to their fullest advantage. Don't neglect the school hall display cases. The display cases in your shops are important, too, but the big stakes are out in the halls. If you're not systematically using them, stop losing one of the finest mediums you have for visual expression! □

Mr. Mugerian is an industrial arts instructor in the Los Angeles schools.

on opening the school shop

Starting the new school year affords the industrial educator an opportunity to begin again with renewed enthusiasm. Converting this revitalized energy into an achievement of something important during the coming year, however, requires that the teacher conduct an inventory of what effective practices he can utilize as keys toward this achievement.

As an aid to an awareness of these practices, the following three articles consider the "opening of the school shop" for the three possible teacher situations:

1. For "new teachers," William Micheels offers a check list of reminders of things to do in basic areas which can make the difference between success and difficulty.

2. For experienced teachers in a new situation, H. L. Helton discusses points to remember when adapting to a different and challenging role.

3. For teachers "at the same desk" this year, John H. Adams suggests hints for a fresh start in the areas of physical appearance, supplies, course organization, and the first day.

We hope these considerations on how to open the school shop will contribute toward making the coming school year a "happy new year!" □

special report

How to Start the New Year

JOHN H. ADAMS

□□□ ***For every teacher, practical suggestions on how to get off "on the right foot" toward making this year a satisfying one.***

One of the larger advantages to being a teacher as against being, let us say, a stock clerk in the F. W. Woolworth Company, is that we have about a three- to four-month jump on the business world. We can make our resolutions, our fresh start, and our big plunge in September when everyone else is tired, nervous, and run down. Where other professions and businesses go on and on endlessly, we teachers get a new chance every year to start all over again and to start off properly — if we're so inclined.

Physical Appearance

"Starting off properly" begins with the general physical appearance of your shop, of course. One of the things that discourages students quicker than any other in the school shop is walking from that spotless hall out there into a messy and cluttered conglomeration of assorted impedimenta — all in ill repair and unsharpened. It takes but a few minutes to sharpen a plane iron that is merely dull, while it takes a good deal of time to recondition one that has been used and abused over a period of months or even years. Certainly at the beginning of the year all tools should be sharp and ready to work.

Machinery, in addition to periodic sharpening and lubrication also requires a coat of paint about once a year, and before school starts is as good a time as any. A student is considerably more casual about oil spillage and grease sloppage around a grimy old machine than he is around a newly painted one. The general impression given by a new paint job is that the machine is a new one, and he'll figure he'd better operate it properly and take care of it or he'll flunk the course. The same psychological approach applies to benches which, if they have hardwood tops, would benefit by a sanding and varnishing job. The treatment they'll get will be considerably more respectful if they're fairly smooth and shiny.

The various signs and instruction sheets around the shop have a way of collecting sawdust, fingermarks, and cobwebs. Most of these signs are free for the asking from manufacturers — and a new one will make more of an impression than a faded one with someone's thumbprint across Step 2 in General Operation Instructions. Bulletin board material loses its effectiveness rather quickly; certainly there should be new material on it at the beginning of the year when you're starting off anew.

In addition to your obligations to the student, you have certain responsibilities to the administration. Right here at the beginning is a good time to get them straight. Check with the office and find out before school starts what records and reports are expected of you. Know the school policy on such things as absences, tardiness, smoking, and disciplinary problems. In some systems there are very definite policies on the handling and collection of money by the teacher. Above all, establish a good working relationship with the administration and the other teachers. Incidentally, you may as well find out if you're going to be expected to whip together the scenery for the Thanksgiving pageant, holders for the Christmas trees, or provide a 40-ft. Maypole two days after spring vacation. It's best

Mr. Adams is an instructor in Cold Metals, Ohio University, Athens.

to know about these little tasks sooner than the day before they are due.

If you are a new teacher in a new school, there is probably one other major job for you to do a few days before school starts. Any specimen of human being who has lived anywhere for a period of longer than three weeks seems to be addicted to "collecting." If your shop was occupied by someone else last year, be heartless and throw things out! Even if you're an old teacher returning, or a middle-aged one for that matter, *throw things out!* There is nothing that detracts from the appearance, efficiency, and general businesslike atmosphere of a shop more than clutter. Surplus material too short to use and too hard to cut, files that don't file and paint brushes with bristles only ½ in. long don't belong in a school shop. If the old files didn't file last year, they won't file any better for having rested in a drawer all summer. Usable short pieces of wood, odds and ends of paint and ink, valuable small-sized metal lengths will accumulate soon enough.

On Supplies

Whenever possible you should have ordered your supplies early in the summer. Ideally, it would have been best to place your order before the end of the school year. But it's too late to go into all that now! If you *have* ordered them — and they've been delivered during the summer — a few days before school opens is the best time to get them up off the floor, check them in, and store them where you can get at them easily.

If, however, you inherit a new shop or one in which the previous teacher neglected to order supplies for the coming year, you will be forced to build your program, at least for the present, around what materials are available. In one case, a teacher inherited a woodshop situation in which the only lumber available was knotty-pine paneling. He spent two days cutting tongues and grooves, Pickwick pattern and knots from his pile of lumber so that he had a smaller but more usable supply of clear white pine. Let's hope you don't find yourself hip-deep in tongues, grooves, and Pickwick patterns, but a most admirable trait in shop teachers is adaptability and resourcefulness. It may be necessary to eliminate certain operations or areas from your program until the necessary supplies can be obtained. The first step is to make an inventory of the available materials tucked away. In most cases this will produce enough materials to get started, and an immediate order can then be entered. Depending on your school system you should have your materials within a few days, a few weeks, or a month at the latest.

It is a good idea to take inventory of your supplies at least twice a year, and keep a record of this inventory yourself. Don't depend on the ordering department's files which are always over on the other side of town. Having your own records simplifies ordering because you have the number required on each item, the proper nomenclature, and you have a record of the supplier and his address at your finger tips.

Make sure your open storage bins, racks and compartments are filled before the start of the school year. There will be a great saving on stock if this material is cut up by you, or ordered in sizes from which the most economical use of materials can be made. This results not only in the saving of materials but expedites the distribution of stock to the students. For example, we've found in the use of 18-ga. aluminum sheets for spinning that by working out a cutting diagram for 2 by 8 ft. sheets, waste is cut down considerably if the instructor cuts out squares himself, and then allows the student to cut from these squares the circles he needs for spinning. A number of different-sized squares can, of course, be cut from one sheet depending upon the sizes most used in your shop.

Standardization of hardware such as nails, bolts, and screws is a necessity in a school shop. When planning projects, also plan the hardware you will need. For example, selecting a variety of lengths, sizes, and heads of nails rather than trying to stock every one the manufacturer offers will make you less popular with the local nail salesman, but it will lessen your ordering and storage problems considerably.

If you are lucky enough to have the summer months or any portion thereof free from outside work you are luckier than most of us. The farther in advance of the first day of school you can do any of these jobs the more smooth running will be the opening day of school. If you have time through the summer, visits to historic spots, to museums, and to industry will help you with your fall program. If you have a home workshop or if the janitor trusts you with a key to the shop, this is the time to try out some sample projects that you've seen during the year. Project samples on display are even better inspiration than pictures or drawings.

Course Organization

A course outline is always a great help in getting off to a proper start. This aid not only gives your course direction but enables those who follow you or those who are unfamiliar with your particular area to better understand the program you are teaching. Don't be afraid to include new materials and techniques. The lampshades with the fringe on the bottom made a tremendous impression on the flappers, but a rough-textured one over a base of wood neatly turned on a lathe goes over much better in 1961. New materials and new techniques may involve the development of new areas or simply the rearranging of the physical facilities to make an existing area more effective.

It is a good idea to make your curriculum as flexible as possible. As class size varies, very often the teacher will not know the maximum and minimum class sizes until he has the group staring at him from the other side of the bench.

In a large class you may want to experiment with a mass-production job which would involve the entire class; while in a section of eight or ten students more advanced individual projects would be possible since the teacher would be available for more individual help. Through industrial publications such as *Oilways, Steel Horizons, Weyerhauser News,* and many others — which are free to industrial arts teachers — you may keep abreast of the latest developments in industry. Certainly these developments in our modern technology should be reflected in the industrial arts curriculum whenever possible.

Physical facilities such as the number of work stations, and the number of tools and machines should be considered in setting up the program. In some cases it might be necessary to break the class up into small groups working in various areas and changing areas from time to time. This means more demonstrating on the part of the instructor; but basically, teachers all have a little "ham" in them and demonstrations give you a good opportunity to perform your skills in front of a captive audience!

Some basic exercises serve a very valid purpose, and you may want to start off with a simple basic exercise to give the students the "feel" of the medium in which they will be working. If exercises are used, however, there should be progress to something that will stimulate creative imagination of the students. This is where your "collecting" tendencies should be put to good use. Keep collecting project ideas in a file, placing them in a conspicuous spot where they'll be available for consultation readily and easily.

The First Day

The first day of school is a day of excitement, anticipation, and nervousness for the students. They are trying to get off to a proper start, too. It is a good idea, if possible, to have them sit in an assembly area in the shop, and during the first few minutes of the

shop period orient them to the purpose, objectives, and the scope of work that is to be done. If the teacher has experience in industry, he can use his experience at this time to emphasize the importance of industrial arts work to the new student. State your shop policy. Explain to the students exactly what is expected *of them* and what you expect to do *for them*. A definite understanding at the beginning of the year can save many disciplinary headaches in later days. Go slowly on familiarity with your students, though. It's much harder to "crack down" than it is to "loosen up."

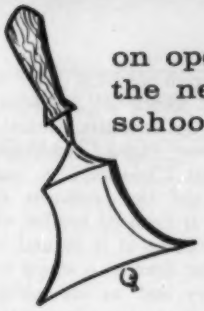
One slightly "corny" suggestion is for the teacher to write his name on the blackboard the first day. When I was young and in ninth grade, we had a general science teacher who never told the class his name. At that age we were all too self-conscious to ask him, and we worried about it so much we never listened to a word he said. Along about October someone finally asked another teacher; he told us, and we all felt better. Until that time we looked upon the general science teacher as a sort of dishonest, temporary lecturer who had something to hide.

An explanation of the tools and equipment, safety hazards, and regulations should be explained on the first day, too. Very often this procedure can be accomplished through a shop tour. Walking around gives everyone a chance to get up, talk to his neighbor legally, and breaks up a session of inactivity. Encourage questions about the equipment and projects.

Sample projects, ideas, plans and literature should be prominently on display at this first meeting. Your students will be encouraged by what they see. Give them an opportunity to look over the material; let them pick up the projects and inspect them, since most will be curious and want to know how these things are put together.

If you make sure the physical facilities are all in the best possible condition; if you know the school policies; if you have the materials with which to work; if your curriculum is organized and flexible enough so that you keep pace with changes in modern technology; and if you start off on the first day laying a solid foundation of inspiration and understanding, you can't help but start the new year right.

Whether you're a new teacher in a new shop, an old teacher in an old shop, or just a plain ordinary teacher in a plain ordinary shop, approach each shop year with the attitude that you have a new opportunity to progress toward making your course more stimulating for the student. After all, you have a brand new chance this September. □



on opening the new school year

Tips for Adjustment by the Teacher in a New Situation

H. L. HELTON

□□□ ***How to adjust to the new situation in school and in the new community is the subject of this practical examination.***

Basically you and I would agree that among the things we want in our life and teaching is happiness. We want to be happy and we want to be successful. Our happiness can very well result from our success in teaching and success in teaching depends on a great many factors.

The main topic, or main classification of all our problems, would generally fall into one area, and that would be the problem of adapting your past education and experience to fit the new role which has been assigned to you by your school and your community. You have a role assigned to you when you become a teacher; you have a role assigned to you when you become a member of a community. Each person in that community has a role, and one of our great tasks is to discover that role, to understand our role next, and then fit it. Now this does not suggest that ambition should be diminished; it does not imply that your specialty should be downgraded. It merely suggests that we realize that we are becoming a member of an operative unit. The unit has been in operation for some time in most cases, and we have become a new member of it.

Now one of the best ways to identify an assigned role in any organization is to become an active member of the group. To identify your role in the school, visit with your administrators or supervisors and be able and willing to accept sincere advice. Listen to the other teachers, observe the practices of those teachers who seem to teach effectively, and watch your supervisor as he works with the other teachers. You can profit from these things, and you can learn what the administration wants.

The next thing is a task which is very important and perhaps is not covered adequately in counseling teachers. This is adapting yourself to fit your role in the community.

The best way to understand your role in the community is to become an active member in your community organizations. Among those persons whom you should visit first in a new community would be your local representatives of government, your township supervisor or councilman, whoever it may be. Another person on that list should be, of course, the head of your church.

Mr. Helton is instructor of drafting, Denby High School, Detroit, Mich.

Another person should be your banker. This is not mentioned facetiously, but to more or less stimulate thinking about some of our financial problems. Remember that a teacher is a "seasonal" employee and that summers can be very long. If financial trouble will disturb us at home, it is natural to take some of that burden to school with us. If we worry that we are robbing our families of time or services and recreation, we take that problem to school too. Sometimes when we find ourselves in a difficult situation, the local banker is the first person we should see.

Of course the most sincere advice to any teacher is to remember that a college educated member of society has responsibilities to the society which made that education possible. The boys and girls under your care are entitled to profit from your experience. The students who come to you in the classroom will appear for many and varied reasons. Some will come through coercion, some through persuasion, but the majority will come with an honest desire to satisfy curiosity — or to learn, if you please. Your position as a teacher is an excellent opportunity to either satisfy that curiosity and promote new interests or it is an opportunity to discourage all hope for happiness as the youngster progresses in his education.

There is nothing that a student will detect faster than your lack of interest in him as an individual. If you attempt to teach information rather than teach boys and girls, you will lose the greatest advantage that you possess. Teaching is a profession which requires skill, warm human understanding, patience, imagination, and a sincere belief in what is taking place.

Remember that you have been well prepared for a specific job and that your preparation was based on long-tested theories. When the situation is wrong there is a temptation to assume that the philosophy was wrong. Too many good teachers are tempted to discard all sound methods and techniques which have been taught to them when, actually, the difficulty rests in the school situation rather than the methods.

Now in quick summary, let us review the main problems with which we are faced. First, we need to identify our role in the community and the school. Second, we need to feel comfortable and secure in our home. We need to remember that we have been educated for a responsible position in our society and last, we need to remember that students will respond to understanding effort on the part of a teacher if that student can see the immediate objectives. □

on opening the new school year

A Checklist for Beginning Teachers

WILLIAM J. MICHEELS

□□□ *Capsule guidelines for the "first-year" teacher on effective practices in the shop's teaching-learning environment.*

It is difficult* for a beginning teacher, or any teacher, for that matter, to keep in mind many things to do as he begins his year's work. For this reason the following list of reminders has been prepared. The list is not all-inclusive, but should help bring to mind factors which are important. While reading this material, it is suggested that you underline or make notes on important points that you wish to emphasize.

The suggestions contained herein are aspects with which you were familiarized during your student teaching activities. Some of these reminders are direct statements; others are in question form. (It is not the structure, but the reaction that is important.) The main point is that you should do more than read this list over, and it is to be expected that you will show continuous improvement in the physical aspect and teaching environment of your shop.

1. **Inventory.** Remember to ask at once for an inventory of your shop and supplies. If no inventory is available, be sure to take one immediately and to file a copy with the superintendent, supervisor or principal. Such a procedure may save many embarrassing moments later on in the year and will make a good impression.

2. **Clean-Up Schedule.** Have you organized a clean-up schedule? This should be done during the first few days of the term.

3. **Shop Personnel System.** What about your shop personnel system? Will you have a general foreman, tool foreman and supply foreman? Will you have one foreman? Are your classes to be organized in such a manner that any such system is unnecessary?

4. **Records.** What system will you employ in accounting for the materials used by students? Card system, plan of procedure record, material foreman, day to day list — these are some of the possibilities. Find out early what reports must later be made so that necessary data may be accumulated.

5. **Storage.** Do you have adequate space for the storage of students' materials and projects? Look into this matter before anything is lost. "Well begun is half done."

6. **Students Records.** Have you examined the student records in the main office or in the personnel department? Remember that it is very important to have as complete and detailed a record of each student as is possible. Again, a card system may be advantageous or a cumulative record folder would be better if there were room for filing these for each person enrolled. Notes on individual students should be entered from time to time. They will prove helpful on many future occasions.

7. **Filing System.** Do you have a system for filing working drawings of projects, catalogs and price lists, book lists, related information and the like? By means of post cards you can get an abundance of free instructional material from manufacturing and sales firms.

8. **Organized Plan for Continual Improvement.** When you have thoroughly studied your shop as a place of work and instruction, you should formulate an organized plan for con-

(Continued on page 68)

* This statement was prepared by Dr. Micheels in 1939 when he was a supervisor of student teaching at University High School.

INEXPENSIVE MOSAIC TRAYS

HAROLD H. SCHWERR and WILLIAM LAGE
Industrial Arts Instructor, Austin Junior High School
Sheet Metal Instructor, Austin Area Vocational School
Austin, Minnesota

Mosaics? Ageless! Contemporary! Exciting! Very much so. How does the foregoing statement fit into the modern industrial arts program of today? Very easily, with the following project in mind. This is a good eighth grade combination metal project making use of mosaics. The trays may be used as ash trays, candy dishes, pin trays, or as a decorative piece for the favorite spot in the house.

In the commercial kits the tray is usually brass; to reduce expenses, however, galvanized iron was used here. The trays may be made into various shapes and sizes. If feet are desired on the project, welding rod will serve the purpose.

This project will meet the many requisites in the industrial arts program: layout and design, use of hand tools and machines, assembly and finishing, functional and low-cost — and to top all of these requisites the following described project has excitement, high motivation, and home appreciation.

The following lists, drawings, and illustrations will help to describe the project.

Materials Needed

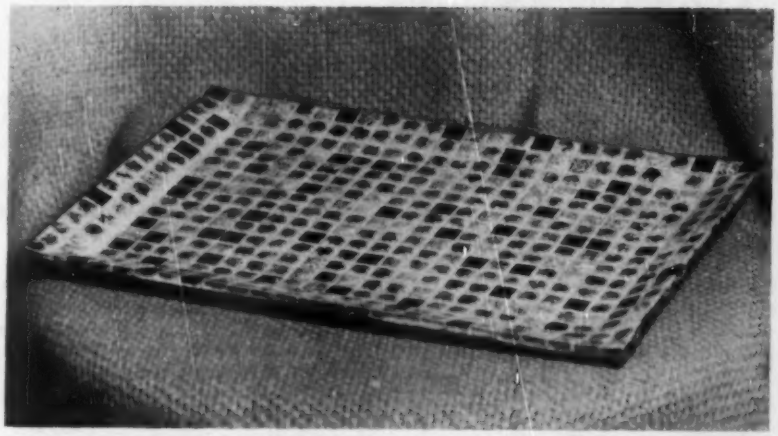
1. 22 or 24 ga. galvanized iron, 5 by 5 in. square.
2. Solder and flux.
3. Elmer's glue (to glue on the mosaics).
4. Mosaics of choice by size, colors, and price.
5. Grout or spackling cement.
6. Grout sealer (TEC silicone sealer).
7. Flat black paint or
8. Gold spray paint (this will simulate a brass color for the bottom and the sides of the tray).

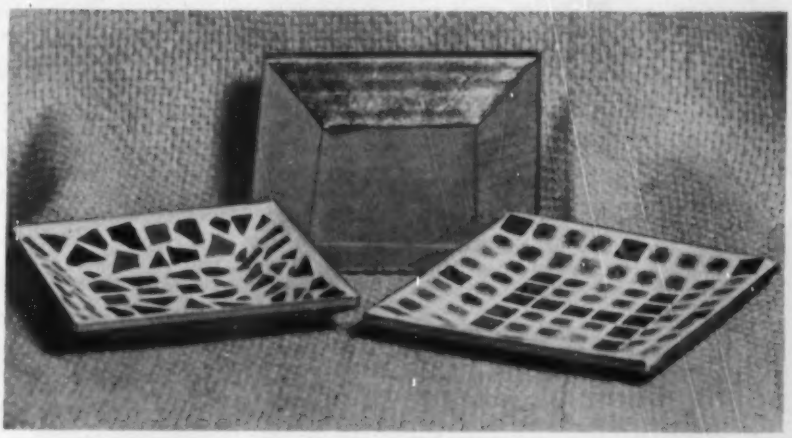
Tools Needed

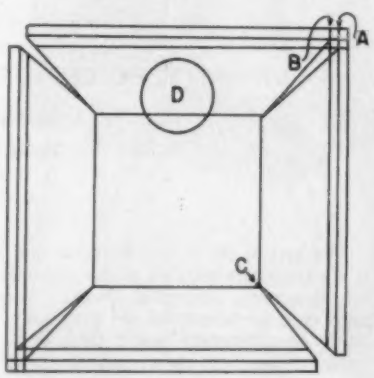
1. Rule or marking gauge.
2. Scratch awl.
3. Hand shears.
4. Prick punch and hammer.
5. Small brake or a bar folder.
6. Soldering copper or an electric iron.
7. Mill file or grinder to clean off any solder from the back of the tray before the mosaics are applied.

Procedure

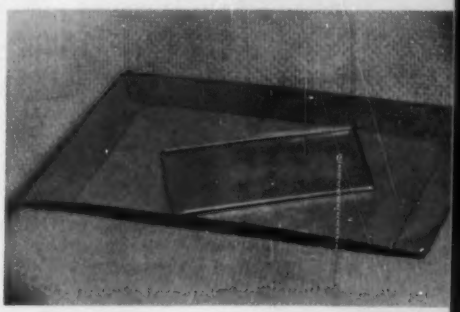
1. Cut out galvanized iron to a 5 by 5 square.







Examples of tray frames and finished trays. At the left is a diagram of the cutting lines.



2. With rule and scratch awl scribe a line ⅛ in. in from border.

3. Scribe a second line in from the border ¼ in.

4. Scribe third line 1 and ¼ in. in from the border.

5. Prick mark at heavy black dots.

6. Scribe lines with awl. Now cut with the hand shears.

7. Following the dark heavy lines cut out the corner waste. This is done to provide clearance when the sides are bent up.

8. After the corners have been cut out, carefully bend at an angle of 90 degrees in the bar folder or in a machinist's vise.

9. Then grasp the outer edge of the tray and bend up all around the square until a tray is formed. The better the job of cutting the corners, the easier the result for soldering and looks in the final appearance.

10. The next step is to solder the corners.

11. The soldering job should be neat but not too necessary as the mosaics cover up the soldered joints.

12. Turn tray over on the back and if any solder has come out the corners, file or grind smooth.

13. The mosaics are now applied, in a design of the student's choice, with the glue. Space the mosaics about ⅛ in. apart.

14. After the mosaics have been applied, put tray away to dry for 24 hours.

15. Then mix up the grout or spackling cement and fill in the crevices. Spackling cement is more reasonable than grout and it also does a good job. The cement may be purchased from any paint and wallpaper store.

16. After grouting and cleaning off the excess, set trays aside for 24 hours to dry.

17. Then the grout sealer is applied. (Necessary if the tray is to be used for an ash tray).

18. Flat black paint or gold spray is applied to the bottom and sides. After drying the project is ready to take home (to be admired by all).

The cost of this particular project will run from 69 to 75 cents. The time element will be about two weeks at the most. The project can also be used as a filler between areas or at the end of the school year. We used ours for Christmas presents.

Check points for grading can be after the lines are scribed, cutting out the waste corners, bending, soldering, checking the design, and then the final grade after the tray is finished. At Austin we have had great success with this project. In place of solid squares of mosaics, the mosaics can be chipped up into smaller pieces and a design worked out. For the boys who wish to make bigger trays the cost rises, naturally. The trays can also be flat and square or they may be rectangular in shape, with feet added. This will enhance their beauty and fulfill many functional uses. The basic project, however, needs no selling once the boys see a few samples. □

project design sheets

This series of project development sheets proposes to provide the industrial arts teacher with samples of projects he can use in instruction. Each will be briefly discussed and accompanied by the necessary drawings and plans of procedure. It is hoped that the reader-user will regard them as projects of an acceptable level of design, for they have been developed with this thought foremost in mind.

As the authors of this series conceive of it, they see several advantages to such a set of project plans:

1. It fills a very real and serious need for project ideas.

2. It can serve to stimulate the student and the teacher to undertake design tasks of his own choosing. This desirable activity can occur if the teacher will emphasize two points: First, that the project as a logical solution to a problem must satisfy certain material, functional, and visual requirements; and, second, that much planning and thought necessarily goes into the development of such projects.

3. It can provide a measure of highly desirable problem solving activities for the students. Remember that these project sheets were planned to facilitate instruction and aid the teacher. He can provide a student with a plan for some project, and require that the student solve the problem of what specific materials to use, and why, and how to make it, and why. This is a measure of problem solving.

4. It can serve to provide the teacher in the multiple-activity areas (general shop) with projects to "get the student started." This is always a problem to such teachers.

The above thoughts, then, are the rationale for this series of project plans. As a parting thought, the teacher is strongly urged to use them judiciously, to the end that they can become only a part of his teaching program. Somewhere along the way, he should make some provision for student project design activities of an individual, creative nature in order to achieve the completeness all industrial arts programs both deserve and require. □

BOOK ENDS

GILBERT R. HUTCHINGS and JOHN R. LINDBECK

Associate Professors

Western Michigan University, Kalamazoo

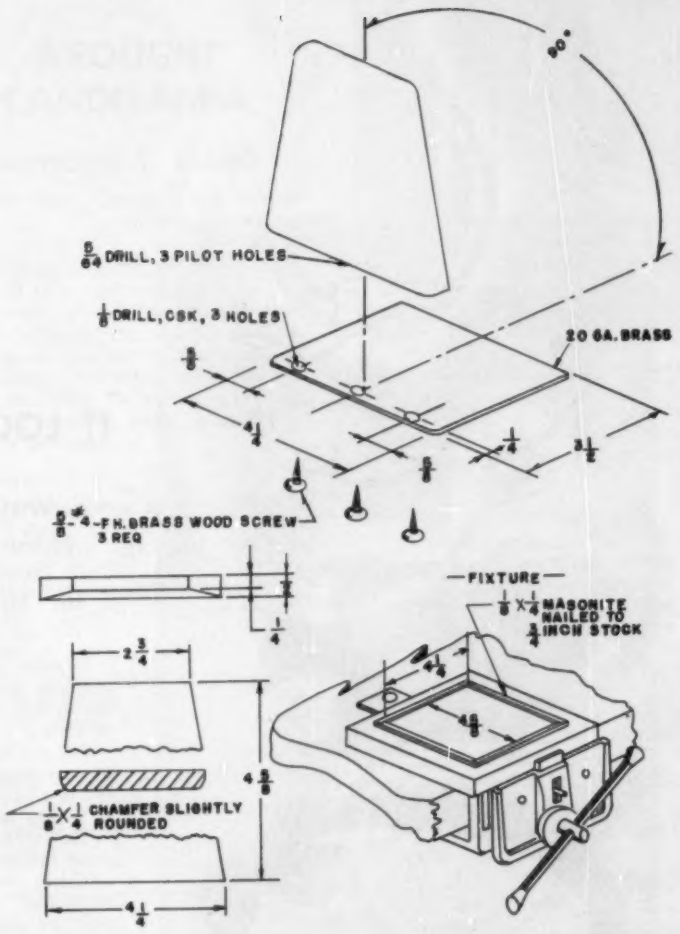
The first of the series, the book ends, is a satisfactory solution to the problem of adequately supporting books. The book ends are functional and, materially, they are structurally sound, there is no excess or improper use of materials; and they are pleasing in appearance. One might argue that a simple rectangular piece of wood could have sufficed in this instance. This is true, but the gentle slopes and angles, and the subtle breaking of the sharp corners lends an air of

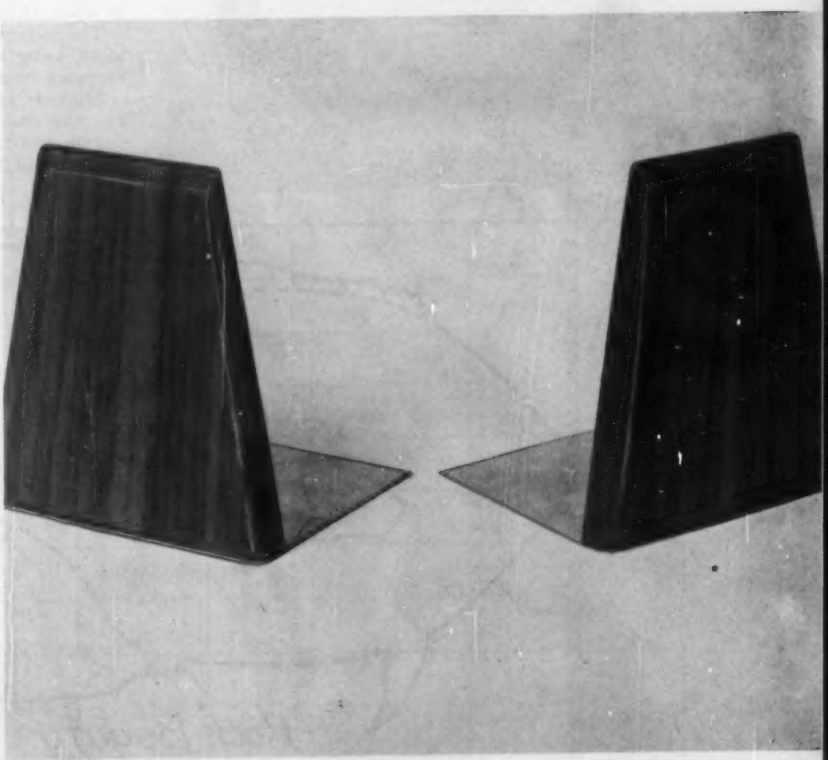
grace which does not obtain with the pure rectangle. It becomes a matter of choice, the designer's intimate solution to the problem of visual correctness.

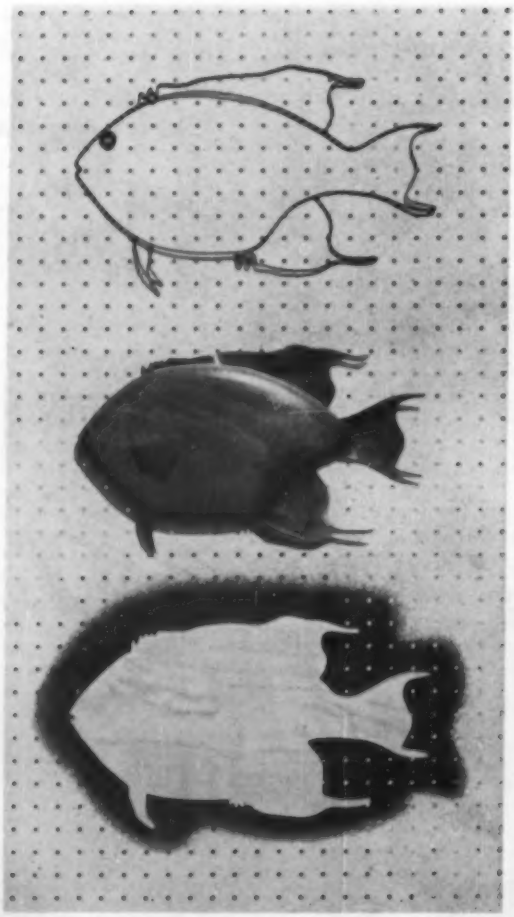
A more satisfactory emphasis of the interesting grain of the teak pieces can be had by avoiding a highly polished finish. The wood sealers, wipe finishes, or linseed oil followed by wax can produce desirable results. The soft finish on this project was obtained by mixing spar varnish (50 per cent), linseed oil (40 per cent), and oleum spirits or turpentine (10 per cent). The brass base was lacquered to prevent tarnishing.

Procedure

1. Obtain stock; two pieces — ½ by 4½ by 5 in.
2. Lay out taper on upright member.
3. Make a fixture (as per drawing) to hold the upright member while planing the taper. If difficulty is incurred in holding the stock in the fixture, insert a screw in the bottom of the fixture. Use a number 10 or 12 wood screw and figure the length of the screw so you have about ¼ or ⅜ in. holding the upright member firmly in the fixture.
4. Plane the taper.
5. Lay out the outline of the upright member.
6. Remove excess stock.
7. Lay out chamfers (⅛ in. on edge by ¼ in. on surface).
8. Plane the chamfers.
9. Hand sand the chamfer to a free flowing curve (as per illustration).
10. Finish sand the upright member. The grit will depend on the material being sanded.
11. Obtain metal for base; two pieces, 18 gauge 3½ by 4½ in.
12. Drill and countersink three holes in each piece of metal as indicated on the drawing.
13. Drawfile the edges (*do not* round any arrises or corners).
14. Clean metal base with 3/0 steel wool.
15. Superimpose the metal base on the upright member in the position it will be attached. (NOTE: Be sure the tapered surface faces in the opposite direction from the projection of the metal base.)
16. Locate the holes in the upright member by marking through the holes in the metal base.
17. Drill the holes in the upright member. Countersink these holes slightly if necessary to enable the screws to be drawn up tightly against the metal base.
18. Attach the metal base. (NOTE: Be sure the screw heads do not project beyond the surface of the metal base.)
19. File the front corners of the metal base *carefully* to conform to the contour of the upright member.
20. File the back corners of the metal base to a slight radius (just enough to take off the sharp corners).
21. Prepare for finish. Clean up with fine abrasive and steel wool as necessary.
22. Apply protective coating on metal.
23. Finish upright member as desired.
24. The addition of felt dots to the bottom of the metal base is desirable. □







IT LOOKS FISHY

WILLIAM R. McNEIL
Industrial Arts Department
Northeast High School,
St. Petersburg, Fla.

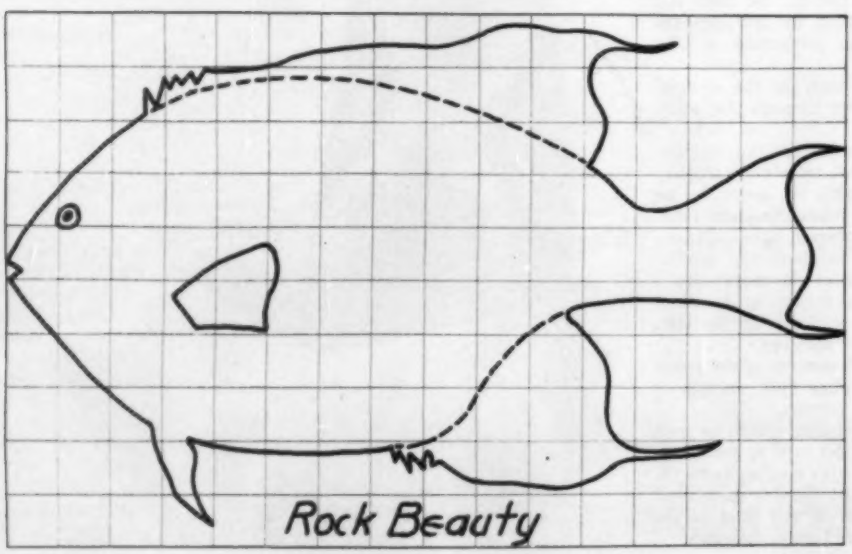
In order to accomplish a variety of purposes with the least exertion, the photograph shows how one drawing can be used in at least three different ways.

The top figure is a wall plaque made of coat hanger wire and soldered. The eye is a ¼-in. washer soldered in place. It is then painted a flat black.

The middle figure shows a modernistic three dimensional plaque. This project combines sheet metal, with brass or aluminum, and wood. Most plaques built are made from a dark wood such as ¾-in. thick walnut or mahogany.

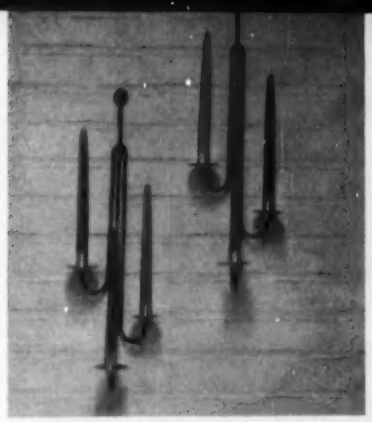
The bottom plaque shows a third variation, being a wooden figure used as a chopping board.

Students can enlarge the squares to any size desired. The illustrations were drawn on 1-in. squares and reduced by photostat to fit an 8½ by 1-in. notebook size. □



WROUGHT CANDELABRA

RAYMOND T. DeMEO
Glastonbury, Conn., High School



From the viewpoint of the teacher, this project is particularly desirable because in its fabrication basic skills are acquired in the areas of wrought ironwork, braze welding, flat metalwork, metal spinning, and machine metalwork. Further, any number of substitutes for the materials listed may be used, i.e., ¼-in. welding or brazing rod may be substituted for the body. Those "scraps" of steel sheet may be used for the bobeche, holder, and sleeve. If no facilities for spinning are available, the bobeches can be hammered from the flat. If the bobeches are to be spun, a permanent metal spinning chuck can be made from metal. This metal chuck can then be mounted on the faceplate of the spinning lathe with machine screws. Removal is simple. When the chuck is to be reused, it only necessitates truing the chuck on the faceplate.

A suggested procedure for the fabrication of the candelabra follows:

Body and Ring

1. Cut body stock to length. Extra stock length has been provided because radius bends will probably not be identical.
2. Make 1-in. radius bend on 24-in. body stock (B) and on both ends of 33-in. body stock (C). A bending jig or machine with a 2-in. collar fitted over the fulcrum pin will do nicely. Before making the second radius bend (C), be sure that the ends face each other when bent.
3. Saw all radius ends to equal lengths.
4. Make the 5/16-in. radius bend on part C around a ⅝-in. diameter fulcrum pin. Allowance will have to be made for the "pull" of the stock. It is advisable to set a stop, or measure from the fulcrum pin before bending; then, alterations can be made from a starting point. Before this bend is made, be sure that radius bends point upward and are set visually at 45 degrees. Experiment, if necessary, with a piece of wire to see the effect.
5. Utilizing bending equipment and/or anvil, locate and bend part (B) at the point where it is brazed to part (C). Another variation of this operation is to file a lap joint at the point of braze. Regardless of method, be certain that the backs of parts B and C are parallel.
6. Make rings (A) by clamping ring stock and ⅝-in. diameter piece of short steel stock in a vise. Heat the ring stock. While hot, hammer the stock around the ⅝-in. pin like a coil spring. Many rings can be made by hack sawing through the coil and forming individual rings in the vise and/or anvil. Assistance may be necessary in forming the coil with an open flame while the setup is in the vise. If so, proceed with caution and protect the vise jaws.
7. Braze part B to part C at point of bend made in step 5.
8. Braze part A to part B.

Holders

1. Cut copper tubing to length.
2. Mount tubing snugly in 3-jaw universal chuck or collet. Face square. Remove all nicks and scratches.
3. Flare tubing. This can be done neatly by placing the ball end of a ball-peen hammer in the tubing and tapping this hammer face with another hammer. Keep revolving the tubing while tapping the hammer face. A third hand may be necessary.

Bobeches

1. Turn hardwood or metal chuck to desired shape.
2. Cut disks with snips or circle shear.
3. Trim. Spin. Remove all nicks and scratches.

Sleeves

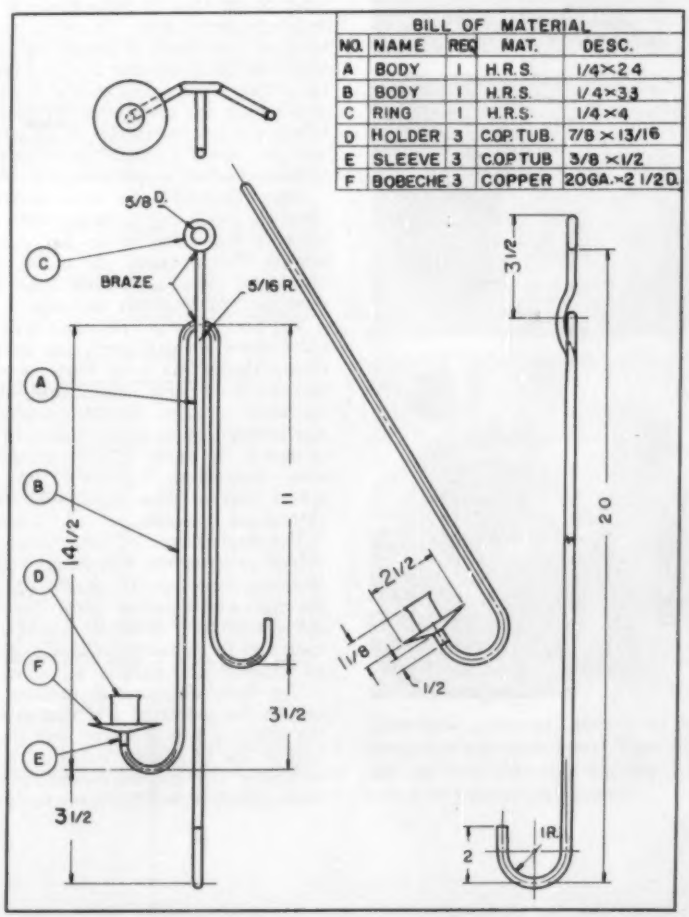
1. Cut copper tubing to length.
2. Mount tubing in chuck or collet. Face ends square. Remove all nicks and scratches.

Assembly

1. Tin bottoms of part D.
2. Tin tops of part F.
3. Center part D to part E with No. 3 handy clamps and sweat together with open flame.
4. Center part F to parts D and E and sweat. (NOTE: With assistance in clamping, it is possible to sweat all three units in one operation.)

Finishing

1. Clean copper assemblies in pickling bath of 5 parts water to 1 part sulphuric acid. (Be sure to pour the acid slowly into the water when mixing.)
2. Polish copper assemblies on the lathe with fine emery cloth. If a higher finish is desired, follow with No. 2/0 steel wool and/or crocus cloth.
3. Spray with clear lacquer or mix 3 parts lacquer thinner with 1 part lacquer and wipe mixture on copper parts while they are turning in the lathe. Several coats will be necessary.
4. Paint body and ring with flat black paint. □



Steps in cutting, bending, soldering, fitting, and assembling the mass-produced animal cage for use in the science laboratory.

MASS PRODUCING AN ANIMAL CAGE FOR SCIENCE ENRICHMENT

ROBERT L. PETERSON and JAMES A. JOHNSON

New Richmond, Wis., Schools

At New Richmond, the problem of supplying animal cages for science instruction in the elementary classrooms was developed into a metal production project. There were 25 cages to be constructed, each with several component parts which made it ideal for use as an assembly line type project.

The first step in the construction of the cages was to design the several parts necessary for the completed product. This was accomplished by assigning the students, by groups, to design and draw plans for one part of the project. The various parts were drawn full scale after which the students checked with each other to see that all parts would fit together properly. After the necessary alterations were made in design, the drawings were taken into the shop and tested for accuracy and practicability. A model of the cage was constructed so that the fabrication process could be developed and the students could see what the finished product would look like.

After the model cage was completed, checked, and found to be practical, the students began the layout and cutting process. Twenty-six-ga. galvanized sheet metal and ¼-in. galvanized mesh wire were used to construct the cages.

The next group of operations involved the forming of metal parts into the necessary shapes. As some students were forming these parts, others were soldering them together. At this point work was progressing on many phases of the project at the same time. Some students were assembling tops and bottoms, others making doors, and still others cutting out the sides.

The final phases of construction involved soldering the wire mesh in place, attaching hinges and hasps, and painting the cages with aluminum paint. Throughout the project, students moved from operation to operation so that each had an opportuniy to work on all phases.

The main objective in utilizing this project for industrial arts was to show the students how industry uses the assembly line to produce items more economically. The students also gained valuable experience in using many tools such as the saber saw, hand seamer, box and pan break, rubber mallet, ball-peen hammer, combination square, scratch awl, straight snips, and duck bill snips. The opportunity to develop skill in designing, drawing, layouts, assembling, and soldering also added value to the project. The project seemed to generate a great deal of interest and enthusiasm in the students.

An animal cage is an essential piece of science equipment for every elementary classroom. Students frequently bring pets to school and a cage is necessary to accommodate the guest. One of the most inspiring and educational experiences a student can have is that of watching a moth or butterfly emerge from a cocoon. This experience is made possible by encouraging students to collect cocoons and place them in an animal cage in the classroom. A cage is also essential for accommodating the parade of insects, snakes, frogs, baby birds, turtles, rabbits, and salamanders which students manage to capture each year. Small animals that are less common, such as chameleons, mice, hamsters, rats, and guinea pigs may be purchased economically for study in science.

The presence of a variety of live animals in the classroom greatly enriches the science program. Having live animals in the classroom permits students to study animal growth, diet habits, reproduction, hygiene, and to experiment with nutrition, genetics, and other areas of animal physiology.

This enrichment is now afforded the elementary students of the New Richmond Public Schools for a final cage cost of two dollars and seventy cents. (The purchase cost of the cages would have amounted to $500.)

While it is essential that the industrial arts area must not be considered a factory for the school, if valid industrial arts objectives can be accomplished while providing invaluable assistance to other departments, total education will greatly profit by such interdepartmental co-operation. □

A VISUAL AID FOR ORTHOGRAPHIC PROJECTION

FRANK P. RICA

Mechanical Drawing Instructor
Summit, N. J. High School

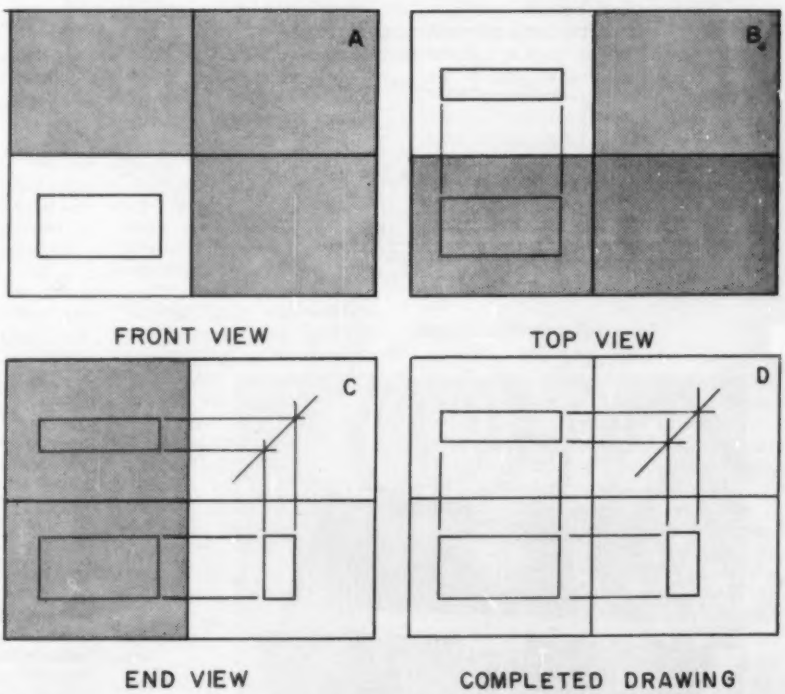
Drafting instructors who have labored through the arduous task of constructing drawings on the chalkboard to aid in the illustration of a particular drawing method or technique, or to emphasize a point, have undoubtedly hoped for a more accurate and orderly method of producing a visual aid. A method which would more effectively illustrate the qualities of neatness and accuracy in drawing which the instructor requires of his students. Chalkboard drawings are comparatively useful and could be relatively accurate if sufficient time were allotted for their construction. These drawings lack the essential qualities, however, which contribute to the utility of a visual aid by requiring the instructor to interrupt the presentation to make necessary adjustments on the drawing. Also, there is considerable difficulty encountered when attempting to show the order and sequence of lines in a particular drawing. To more nearly approach concepts of an ideal lecture-demonstration situation a method of constructing visual aids must be substituted for the chalkboard system which will avoid the very obvious limitations of this system.

The adaptation of plastic-overlay slides to the overhead projection technique has created a facet of visual communication especially applicable to the conditions present in the drafting room. Many of the major problems evident in conventional methods of utilizing visual aids are adequately solved by employing the overhead projection system in place of the standard chalkboard illustrations. This projection system provides a means of illustration that enables the instructor to systematically construct a drawing on a screen in color and with a minimum amount of darkness. The instructor is able to accomplish this while facing the class and with sufficient flexibility to allow for the explanation of each construction detail and a discussion of each problem that arises. All that is required for the successful inclusion of this extremely useful visual aid is an overhead projector, a supply of commercially produced slides or the materials to produce these slides (which are amazingly inexpensive and surprisingly simple to produce), and a willingness to implement new ideas into the course.

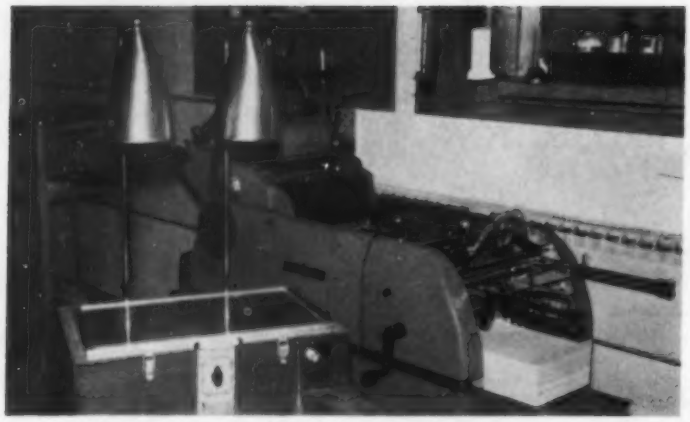
An example of the adaptability of this projection technique to the successful presentation of drafting material is found in the treatment of the problems involved in the teaching of the principles of Orthographic Projection as related to multi-view drawings. The specific problems involved in this area are the methods of projecting the principal views and the relationship of these views. I fully realize that there are other problems but these two will suffice to explain the adaptation of this process. The sequence of producing each view and the methods of employing the one view as an aid in producing the other views is made comparatively simple when each successive view may be projected on to a screen in various colored lines. In order to simplify the explanation of this process the construction of a three view drawing will be used as a model lesson employing the overhead projection technique.

Three slides are produced in three colors. The first slide contains the front view of the object placed in the appropriate position on the drawing paper. The second slide contains the top view with the essential projection lines and also placed in the correct position on the paper. The third slide contains the end view with projection lines and in correct position on the paper. All lines which must be used to explain various functions, are in different colors to aid in differentiation. The first slide is projected and will show the shape of the object and its proper place on the paper. The second slide when projected together with the first will show the front and top views in their respective positions with the projection lines for use in the explanation of the projection method. The third slide when projected together with the previous two will show the completed drawing with all projection lines included. Each operation which is essential may be explained in detail as the drawing is gradually completed on the screen.

This is only one of many possible applications of this process which is amazingly versatile. The usefulness of this projection method to the improvement of teaching methods in the drafting course finds its limits only in the instructor's imagination and ingenuity. □



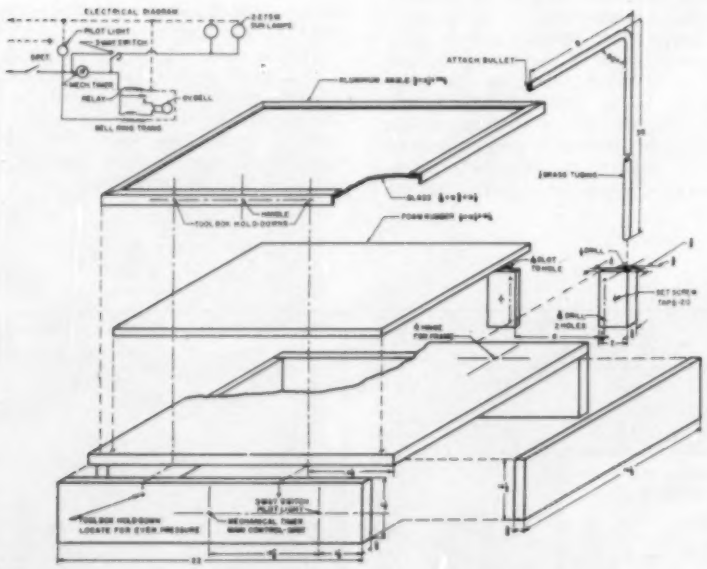
The four steps in visual presentation of orthographic projection. (The white area represents the new slide in a different color, with "D" being the completed drawing with the three superimposed panels.)



A NEW AREA FOR YOUR OFFSET PRINTING LABORATORY

Below: details of the exposure frame — viewed above with other offset equipment needed and by itself (below) — which can expand the teaching uses of your offset laboratory.

LELAND SWEEZEY and ROBERT E. BUSING
Co-operating Teacher and Student Teacher
Baldwin, N. Y., Senior High School

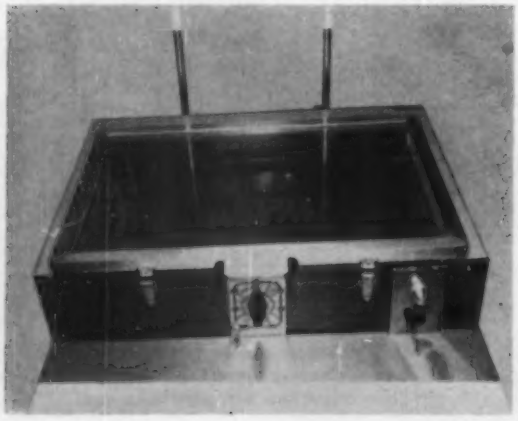


An exposure frame can be used to include a new and interesting area to an existing unit printing laboratory. However, due to the initial cost of commercial exposure frames, they are often excluded from limited shop budgets. It was the complete shop facilities at the Baldwin Senior High School that enabled the exposure frame described below to be completed.

An exposure frame is operated by placing a photographic negative over the photosensitive side of a metal or paper master. The negative and master are then exposed to ultraviolet light for a predetermined length of time.

In order to have sharp lines reproduce well on a master, there must be perfect contact between the master and negative. Commercial exposure frames employ a vacuum blanket for this purpose.

However, the same end may be achieved by placing foam rubber on a firm even base. If the master and negative are then placed on the foam rubber, face up, the air may be removed



Bill of Materials

Quan.	*Name of Part*	*Material*	*Size*
1	Bell ring transformer		110 v.–6 v.
1	Bell		6 v.
1	Relay		110 v. Pri–6 v. Sec
1	3-Way switch and pilot light		
1	Main switch		S.P.S.T.
1	Mechanical Timer		Up to one hour
1	Frame	Alum. angle	¾ x ¾ x 67"
2	Toolbox hold-down		
1	Handle	Builder's choice	
1	Foam rubber	Zocoate	½ x 12¼ x 19¼"
2	Coml. bullet	Brass	
2	Brass tubing	Brass	¼ x 43"
2	Setscrew	Steel	¼ – 20
2	Support	Aluminum	¾ x 2 x 4"
2	Sides (base)	Fir plywood	¾ x 4¼ x 14½"
2	Ends (base)	Fir plywood	¾ x 4¼ x 22"
1	Top (base)	Fir plywood	¾ x 16 x 22"
2	Sun lamp		275 w.

from between them by applying pressure to the two through the use of plate glass. The exposure frame shown on this page incorporates the essential features of the commercial models.

A wooden base was designed to provide smooth, even support for the foam rubber and to also accommodate the timing mechanism. It was constructed of ¾-in. fir plywood and then covered with 1/16-in. formica. The over-all size of the base is 5 by 16 by 22 in.

On this base was mounted a frame large enough to accommodate the desired masters. It was made of ¾-in. aluminum angle and had outside dimensions of ¾ by 13¼ by 20¼ in. Within this frame was mounted a piece of plate glass measuring 3/16 by 12⅝ by 19½ in.

A piece of "Zocoate" foam rubber measuring ½ by 12¼ by 19¼ in. was adhered, with contact cement, to the top of the base (as shown in the drawing). Then the aluminum frame, with glass, was located over the foam rubber and secured to the base with two hinges. On the front edge of the frame and base were placed two toolbox hold-downs to hold the frame in contact with the rubber. It may be necessary to place shims under the hinges if the pressure between the glass and foam rubber is too great.

Support brackets for the lamps were made from ¾ by 2 by 4 in. bar aluminum. This aluminum was cut and drilled (as shown in the diagram) so that they acted as spring clamps. A setscrew was added to each bracket to tighten the aluminum around the brass stems of the lamps.

The source for the ultraviolet light is two sun lamps which are mounted in two commercial bullets. The bullets are then connected to ¼-in. brass tubing which is bent 8 in. from the bullets at a 90° angle to the horizontal plane. The brass tubing is then placed within the brackets and the brackets secured to the back of the base. When completed, the lamps should be about 16 in. from the glass.

There are two ways in which the exposure frame may be used. One is to make only one master and have a timing device turn the lights off after a desired length of time. However, there may be a series of masters to be exposed where it is desirable to have the lights remain on but have a signal be given when they have been exposed to the ultraviolet light for the correct length of time. The reason for having the lights remain on is the loss of time while the lights cool down to the point where they may be re-lighted. For this purpose a three-way switch was employed (as shown in the schematic diagram accompanying the exploded section).

It will be found that most of the electrical apparatus may be mounted with the base of the exposure frame. With this unit, it was found convenient to mount the main control switch on the plate of the timer in the lower corner where it did not obstruct the use of the timer. □

POWER MECHANICS ACTIVITY IN THE JUNIOR HIGH SCHOOL

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Wisconsin State College and Institute of Technology
Platteville, Wis.

Junior high school students are upgrading and accelerating their activities to mesh with the gears of our ever growing technical-industrial world. Model airplane builders of yesterday find their counterpart of the missile age happily "gunning" their way around tracks in small, self-propelled machines called "go-karts," sporting padded clothes and Fiberglas helmets.

As the karting craze expands across the country, industrial arts shops should capitalize upon the already aroused interest of many students in internal combustion engines. Previously, industrial arts teachers have gazed longingly at the gas engine, recognizing it as a very basic "driving" force, and wondering how the basic principles involved could be taught to the young men of our society in a neat, comprehensible concept.

Nine week units on the internal combustion engine have been taught successfully at the eighth-grade level in the industrial arts class of the Edgar G. Doudna Laboratory School at the Wisconsin State College and Institute of Technology, Platteville, Wis. The unit was perhaps one of the least costly of all areas when teachers ask the support of industry.

Four Problems

When automotive, auto mechanics, or internal combustion units are analyzed, the junior high instructor begins to worry about (*a*) acquiring engines to supplement "doing" or laboratory units, (*b*) the cost of putting such a shop in operation, (*c*) texts suitable to junior high level of instruction, and (*d*) appropriate activities for a laboratory of this type with this age level.

It is evident that no nine-week automotive unit at the eighth grade level could possibly explore the width, breadth, and depth of the automotive units in operation at the present time. Subscribing to the preceding, industrial arts instructors must begin setting up limitations as to what will be emphasized. Power supplied to the power train of the normal go-kart offers a logical selection for the engine upon which the instruction could be based.

Equipment and Texts

The small, 3-horsepower Briggs & Stratton engine became the engine we here at Platteville selected. We found that this was a common engine in go-karts, lawn mowers, and other small power machines used around the homes of the students.

Having selected the small Briggs & Stratton as being one of the most typical small combustion engines, we began acquiring engines for use in the laboratory. Through the courtesy of the above Milwaukee firm, we received one new engine free of charge and the offer of others at cost. Evinrude Motors in Milwaukee donated an outboard for instructional purposes. Two additional engines were purchased locally for $1.50 apiece. Wisconsin Motor Corporation donated a 9.2 horsepower air-cooled en-

gine. These are but a few of the manufacturers who will gladly contribute items and visual aids for use in school shops. Undoubtedly there are many others. Three dollars and fifty cents was the total expenditure for five engines, plus an old Chevrolet engine previously used in such classes.

At Platteville, junior high classes are conducted in college industrial arts shops. Fortunately, no money was needed for tools since we utilized the tools used by the college classes in the internal combustion engine course.

Texts for the unit were manuals secured from Briggs & Stratton. Each member of the eighth grade was given a copy of the company's "General Theory of Operation," "Repairman's Handbook," and "Repair Instructions." All manuals were for the 4-cycle, air-cooled gasoline engines manufactured by Briggs & Stratton. Instructional units were built around chapters and information in the two booklets. Texts are readily available for auto mechanics, but with emphasis placed upon the small Briggs & Stratton engines these two manuals were entirely satisfactory — and free of charge.

The instructional units were supplemented with parts, charts of the Briggs and Stratton, as well as operational charts on the functions of basic component systems of internal combustion engines. Through the vehicles of (1) actual engines, (2) the parts charts, and (3) the operational visual aids, the theories of ignition, carburetion, lubrication, cooling, and other functions were easily clarified and demonstrated to the class.

Course Procedure

Since the class had a two hour block of time, the first hour was utilized to explore the functions of the basic engine used, and the remaining time devoted to laboratory work complementing and reinforcing the theory covered during the first part of the period.

Although the small Briggs & Stratton was the "basic" vehicle of learning, the new automobile engines were not neglected. Whenever units, such as ignition and carburetion were encompassed, principles taught were also related to automobiles, the Evinrude outboard, and the Wisconsin air-cooled engine. After such basic principles were covered, we followed the principle through the automotive field as much as was practical for the grade level and the engines available.

By seeking donations and searching junk yards, we were able to secure numerous fuel pumps, distributors, carburetors and other basic components. Since we still did not have sufficient engines to allow a single person to work alone on an engine, the class was divided into pairs. By close observation, the individual levels of achievement were easily spotted and responded to by assigning rapid learners to the more complicated engines, such as the Evinrude outboard and a mounted automobile engine.

The small engines were mounted on caster-mounted shop tenders. Because no engines could be disassembled, analyzed, and assembled in two hours, it was necessary to supply each engine with a clearly marked parts box.

Many disassembling and assembling sessions degenerate into exactly what the two words mean, and become nothing but a "tear-apart" session. Periodically, during the disassembling of the various engines, students were asked to explain to the class (1) how certain components in their engine vary from those of the basic Briggs & Stratton, (2) any problems encountered in disassembly, as well as (3) any unique features of the component being worked on.

An added feature of this program gave the students a chance to analyze and "trouble shoot" engines after reassembly if it did not function. By actually using functioning engines, the class could determine why it didn't operate, what should be done to get it to operate smoothly, and what adjustments are available for this purpose.

Views of how various types of engines can be mounted on stands and frames for student activity.

Industry Co-operates

Automotive units can be easily and cheaply set up and maintained if the industrial arts teachers will seek the co-operation and aid of automotive industries. This fact is well known. Because of the motivation already present in today's youth, as exemplified by the "go-kart craze," the interest in such a course runs high. The customized go-kart is one of the most idealistic of general shop projects as it involves work in most of the industrial arts areas. Individual interest maintains a high level when junior high students are allowed to bring their go-karts to the shop for maintenance and repair. Many of the "black-leather jacket" set proceed to "set the pace" in such a situation and develop healthy educational attitudes. □

OHM'S LAW DEMONSTRATION PANEL

ISAAC P. HAMPTON
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In order to bring the concept of the interaction of current, voltage, and resistance from an abstraction to reality, a three-dimensional teaching aid may be usefully employed. The Ohm's Law demonstration panel shown here has served this purpose very nicely. With it, the instructor is able to quickly and graphically illustrate the effect of E, I, and R on a simple cricuit. It has the added advantages of being readily portable, light in weight, large enough to be visible by all of the class, and uses low voltage power to remove the hazard of electric shock.

The student not only may observe Ohm's law in action, but at the same time is introduced to schematic symbols used in electrical drawings. The function of a switch and a fuse are also illustrated. Since all wiring is done on the back of the panel a neat, uncluttered appearance is more easily achieved.

Construction Notes

The panel is ¼ by 24 by 28 in. fir plywood. A pastel shade of latex wall paint was used to add color interest. This also made an excellent base for the india ink drawing of the circuit symbols. A spray coat of clear furniture lacquer was applied after all ink work was done for surface protection.

The components include: sockets, miniature candelabra base; lamps, GE No. 40 or No. 46; switch, SPST knife; fuse, type 3AG, 1 amp, surface mount base; wire, No. 22 insulated, solid or stranded; meter, 0–500 m.a. d.c., modified so that it may be plugged into the panel using banana plugs and jacks; and shorting clips, miniature alligator clips attached to flexible leads 6 in. long.

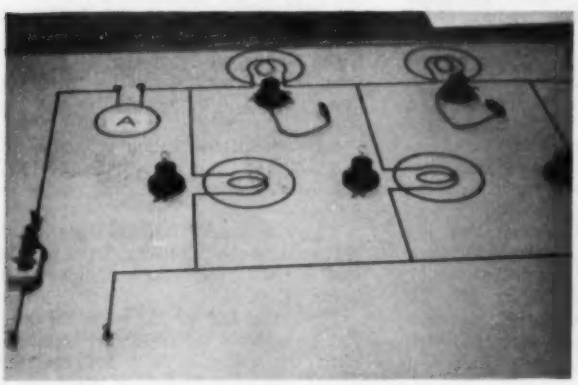
Demonstrations Using This Panel

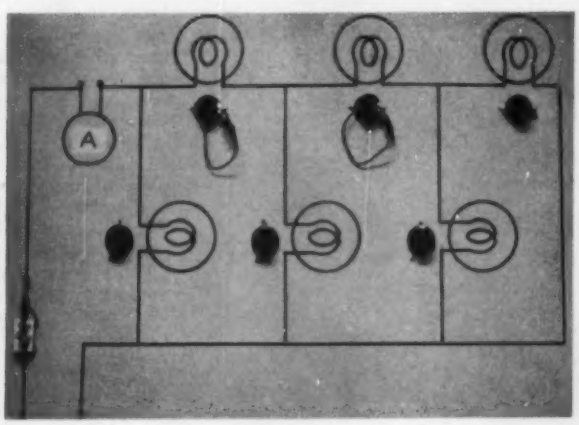
1. Current flow in a series circuit.
2. How I decreases as the R of a circuit increases.
3. How voltage increases as more cells are added to a battery supplying a circuit.
4. Fuse protection in case of circuit overload.
5. How a switch functions to control a circuit.
6. Inverse relationship between current and resistance in a parallel circuit.
7. Difference in behavior of a series and parallel circuit when circuit is changed, added to, or broken.

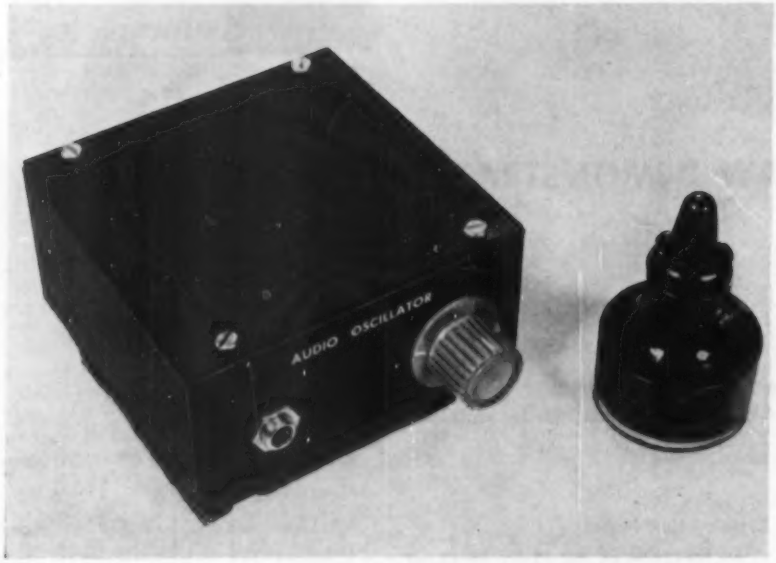
No doubt this panel could lend itself to other demonstrations dealing with Ohm's law fundamentals. A low range d.c. voltmeter would permit showing voltage drops across various parts of the circuit, and would make a useful adjunct to the panel.

A battery of No. 6 dry cells was normally used as the power source. There is no reason why a step-down transformer could not be substituted, so long as the milliammeter were changed to an a.c. instrument. □

Two views of a panel for demonstrating Ohm's Law.







THE AUDIO OSCILLATOR

WM. F. KERNIN
Niagara Falls, N. Y.

During the past year, the electronics branch of industrial arts and vocational education has been receiving increased emphasis — and rightly so. While there are many electronics projects in use, many of them do not use basic principles of construction encountered in industry today.

Here, from the viewpoint of an electronics technician in industry, is a simple project that can be used as a "beginner." Through it, the junior high school student can familiarize himself with modern electronics design and fabrication processes.

This one transistor audio oscillator of laboratory quality has a pure sine wave output of fixed frequency — about 1.8 K.C. — that can be varied in amplitude. The unit is powered by a single penlight cell and uses inexpensive parts throughout. The construction of such a unit will expose the student to semiconductor circuit design, audio oscillator configuration, schematic diagram reading, physical parts layout, and construction techniques employed in building a transistorized instrument.

In addition, the completed unit can be put to practical use at home as a piece of radio test gear or code practice oscillator. Besides the feeling of accomplishment and self-confidence the student will develop in the development of this oscillator, the parents can see and hear a concrete example of their son's progress in, and comprehension of, the modern art of electronics. It is an impressive bit of handiwork to show parents in an age of missiles and satellites.

Procedure

The photos and diagrams detail most of the construction used for a typical unit. Parts layout is not critical nor are the values inflexible. Use what is available — or follow the recommended list. Construction proceeds as follows.

1. Lay out the bottom plate of the 4 by 4 by 2-in. utility box.

2. Drill the indicated holes and mount the two 4 terminal strips.

3. Mount the penlight battery holder — here, hole layout depends on the type of battery holder used.

4. Solder the 82,000 ohm resistor and jumper wire to the indicated terminals shown by the broken lines in the accompanying pictorial drawing. Next, the four capacitors are mounted and soldered to their proper positions on the terminal boards. Finish wiring these parts, but don't solder the transistor in yet — leave this until last.

5. The leads to the coil L1, the output jack J1, and the 2500 ohm potentiometer should all be made about 3 in. long. These parts should be wired in now — they will be mounted to the box later.

6. When all the wiring is completed and checked thoroughly, the 2N1265 transistor is soldered into the circuit as follows —

The wide spaced lead on the transistor is called the "Collector," the middle lead is the "Base," the remaining lead is the "Emitter."

First, the end of the collector lead will be soldered to the proper terminal. Hold the collector lead between the

transistor and the point where it is to be soldered to the terminal with a long nose pliers. Then, solder it to the terminal, remove the heat, and hold the lead with the pliers a moment longer.

Solder the remaining two leads to their respective terminals, utilizing the same procedure as above.

This is a basic practice in soldering a transistor into a cricuit. Transistors are easily damaged by excessive heat. Thus, a heat sink — such as the long nosed pliers — must be used to keep the heat of the soldering iron away from the transistor.

7. Check the wiring again. Then insert a 1½ volt cell in the battery holder (NOTE WELL: Observe the indicated polarity strictly — reversing the battery may destroy the transistor.)

8. If all is well, turn on the power switch by rotating the potentiometer shaft about halfway. There should now be a sine wave signal across the output jack. This can be most effectively seen on an oscilloscope if one is available in the shop. If not, use a pair of earphones to monitor the signal aurally, noting the volume change as the potentiometer is rotated back and forth. This is a pure sine wave with only 2 per cent measurable distortion present.

9. Now that the unit is working properly, locate and drill the holes in the utility box. These holes are used to mount the choke coil, the potentiometer, and the output jack.

10. Finally, fasten the bottom with the circuitry to the box, then screw the cover down in place. Your unit is now complete and in working order.

For a finishing touch, decal labels may be applied to the front panel of the box.

Using the Apparatus

This unit is rugged and simple, but of laboratory quality. It is a basic circuit used in actual pieces of industrial electronics test gear. When completed successfully, it is a piece of test equipment that the student can be proud to own and use.

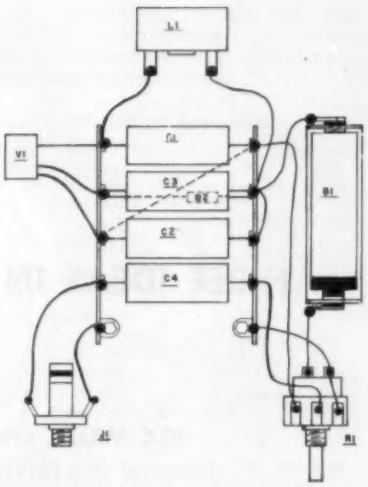
Now for some practical uses of the instrument. To begin with, use it as a code practice oscillator. The audio tone is there — all that is needed is a key and a pair of headphones connected in series with the output jack. Volume is controlled by the potentiometer. In this way the student can learn all about the operation of his instrument while having some fun.

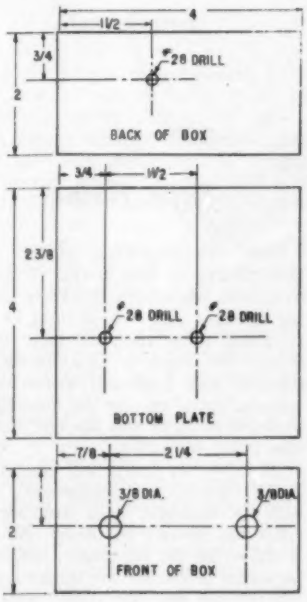
Next he can learn to use it in trouble shooting other pieces of electronic gear. It can be used as a signal source for tracking down troubles in any electronic audio device. A list of typical devices would include radios, TV, Hi Fi sets, tape recorders, public-address and intercom systems (perhaps for the school itself). Guidance in proper trouble-shooting techniques for these devices would have to come initially from the instructor.

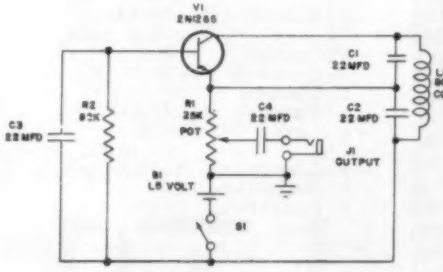
One can readily see how this simple but useful project can increase the student's concept of electronics immensely. The basic facts come from its construction. The broadened viewpoint and increased knowledge of electronics comes to the student when he uses the instrument on other pieces of electronic equipment that surround him in his daily life. □

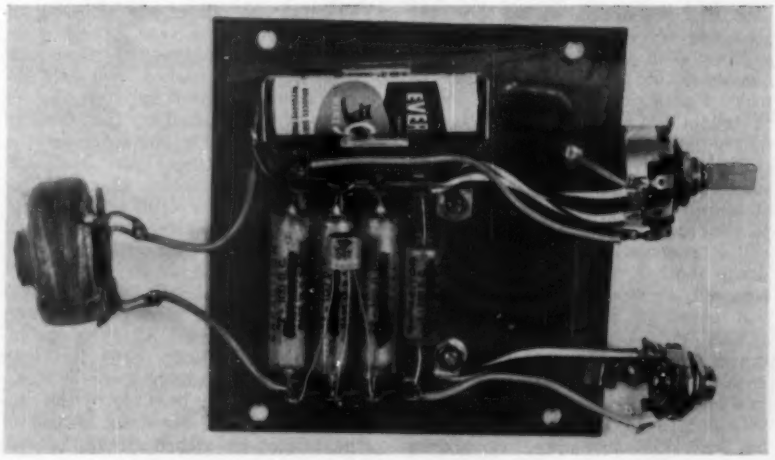
Bill of Materials

R1	2500 ohm Potentiometer, linear taper, with attached S.P.S.T. switch S1
R2	82,000 ohm, ½ watt resistor
C1, C2, C3, C4	Capacitor, paper .22 mfd at 100 volts
L1	80 millihenry choke coil
J1	Phone jack, normally open
V1	Sylvannia 2N1265 transistor
B1	1.5 volt penlight cell
Misc.	4 by 4 by 2 in. utility box, penlight cell battery holder, (2) 4 terminal strips, knob, hardware









THREE IDEAS IN ETCHED CIRCUITS

REX MILLER and GRANT BONSER
Industrial Arts Division, College of Education
State University of New York, Buffalo

Light Flasher

This two transistor, etched circuit light flasher is very useful to students in schools when they go fishing or boating at night and need a light on shore to guide them back to their starting point. The light is also handy when painted red fingernail polish — as a warning signal in case the automobile is disabled at night and the electrical system is not operating.

The No. 49 lamp will not use too much current to operate and, if two Size D flashlight cells are used, the lamp will operate for hours. No switch is shown on the schematic, but one can be added if the builder thinks it is necessary for his operation. This lamp holder was designed and made into a small plastic sandwich box so that all the parts could be seen by anyone curious enough to look at it. However, it may also be built in an old flashlight shell and serve a very useful purpose this way — it would be appropriate, if one should use the flashlight holder, to make a notation on the flashlight case to tell others that this is not an ordinary flashlight but one which flashes.

The etched circuit is not necessary for building the light flasher. It is possible to utilize standard wiring methods to construct the flasher. The etched circuit is suggested in order to give students another look at what is done commercially today in television sets and radios.

This etched circuit diagram was drawn on the board with a brush using an asphalt-based paint and then etched in a solution of ferric chloride. (Etching solution: 13 oz. Ferric Chloride, 1 gallon boiling water, and 1 oz. sodium chloride or table salt). The solution should be used when warm if rapid results are desired. □

Bill of Materials

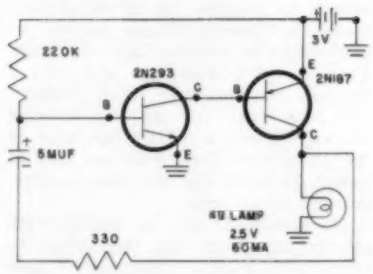
Quan.	*Item*	*Size*
1	Resistor	220 K Ohms ½ Watt ± 10%
1	Resistor	330 K Ohms ½ Watt ± 10%
1	Capacitor, Electrolytic	5 Mfd. 6 WVDC
1	Transistor	2N187
1	Transistor	2N293
1	Lamp	No. 49 2.5 V, 60 ma.
1	Lamp Socket	To Fit No. 49 lamp
2	Pen-lite Cells	1.5 V
1	Printed Circuit Board	3 x 3"

Code Practice Oscillator

This circuit utilizes one transistor, a very common audio type, in setting up a frequency when keyed. A three volt power supply, furnished by two flashlight cells, is keyed by any type of switch or conventional key used in radio work. The headsets should be of the 2000-Ohm impedance type. The 50K potentiometer is useful in controlling the pitch of the oscillator and it is used to adjust the frequency to the desired pitch.

The oscillator is simple to use as it is simple to make. It uses two capacitors, three resistors, a transistor, and a potentiometer. All parts are inexpensive and usually costs less than $1.50 in a radio supply house.

The circuit may be made by the conventional method of wiring instead of the printed or etched circuit method.



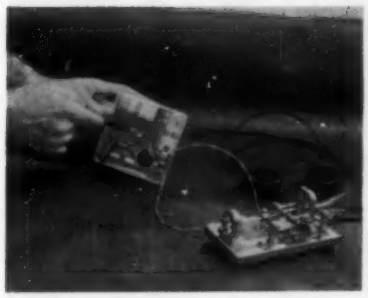
Light Flasher

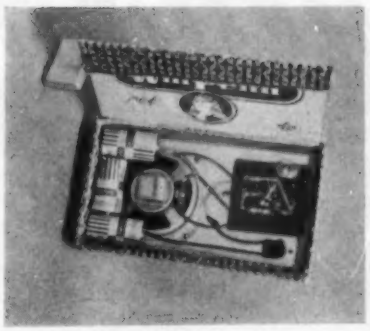
The etched circuit method does, however, provide experience in methods utilized by industry to cut costs in mass produced electrical items. □

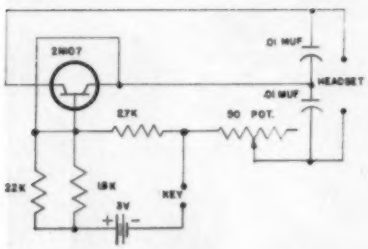
Bill of Materials

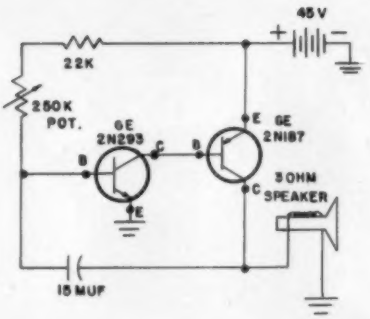
Quan.	*Item*	*Size*
2	Capacitors	.01 Mfd. Any Working Voltage
1	Resistor	22 K Ohms ½ Watt ± 10%
1	Resistor	2.7 K Ohms ½ Watt ± 10%
1	Resistor	1.8 K Ohms ½ Watt ± 10%
1	Potentiometer	50 K Ohms
1	Transistor	2N107
2	Dry Cells	1.5 V., Size D
1	Printed Circuit Board	3 x 3"

NOTE: Headsets of 2000 ohms are needed to utilize the output of the oscillator.









Code Practice Oscillator

Metronome

Metronome

This two transistor metronome is an ideal piece of equipment to build to demonstrate the possibilities of transistors in timing circuits. The metronome shown here was constructed in a cigar box covered with a remnant of grill cloth from a high fidelity set. A switch is added to the circuit to control the device or the dry cells can be designed in a holder which will allow easy removal to disable the circuit and turn it off.

The 250-K Ohm potentiometer should be linear taper and not the regular audio taper found in communications equipment.

By calibrating the metronome it is possible to use it the way any conventional metronome is used to pace the practicing piano player. A dial may be cut from cardboard and pasted onto the fabric cover around the potentiometer and then the calibrations can be marked on the card for future use.

(CAUTION: don't board an airplane (or try to board one) with the metronome turned on and located in a brief case or piece of luggage. It sounds too much like a time bomb to the authorities and it is quite possible that the luggage may be subjected to a dunking and get pretty well soaked.) □

Bill of Materials

Quan.	*Item*	*Size*
1	Resistor	22 K Ohms ½ Watt ± 10%
1	Potentiometer	250 K Ohms Any wattage
1	Capacitor, Electrolytic	15 Mfd. 6 WVDC
1	Transistor	2N293
1	Transistor	2N187
1	Speaker	3.2 Ohm Voice Coil 4"
3	Dry Cells	1.5 V., Size D
1	Printed Circuit Board	3 x 3"

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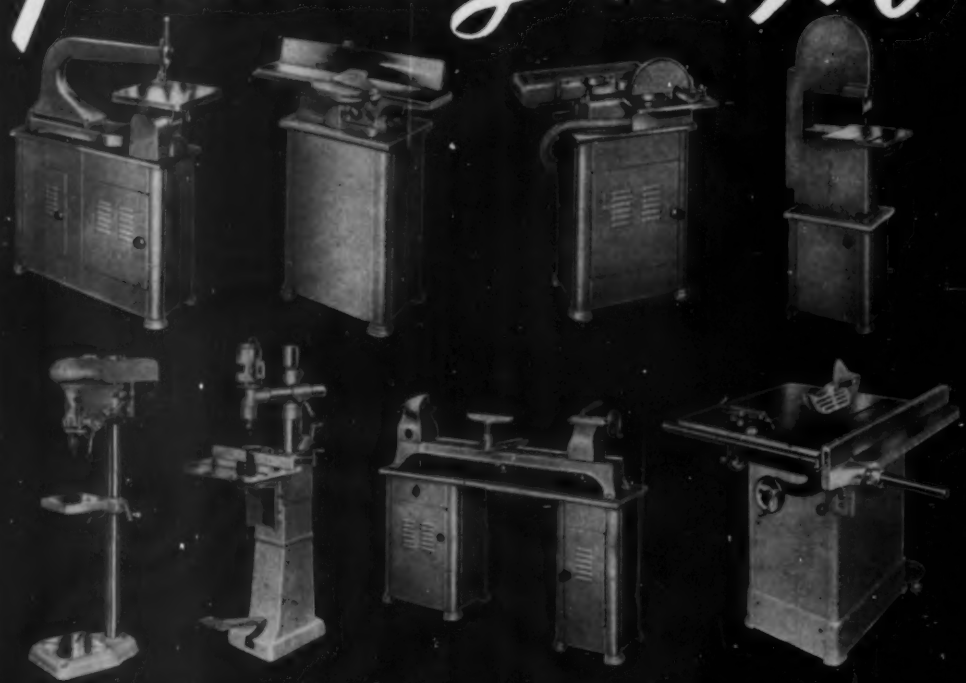

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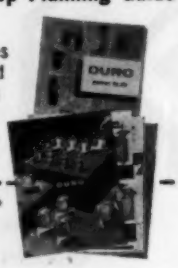

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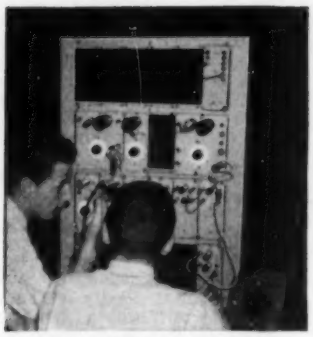

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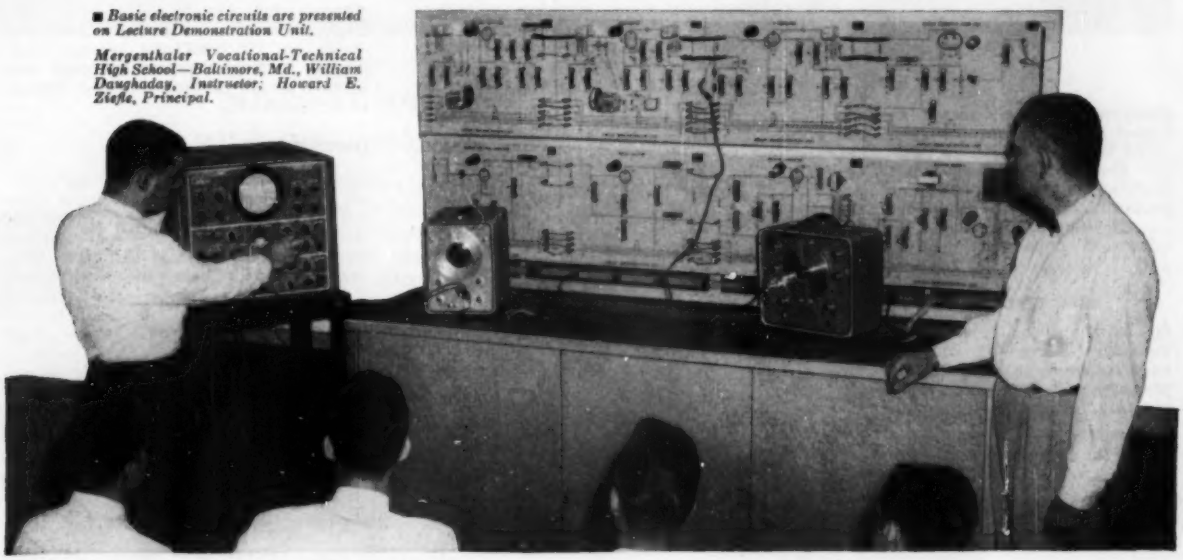

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personal

deaths . . .

☐ *William L. Cooper*, state supervisor of trade and industrial education for Pennsylvania, died on April 16, 1961. He was responsible for the development of administrative procedures for the establishment and operation of area technical schools throughout the Commonwealth of Pennsylvania. Through his leadership, county and state-wide surveys were conducted to determine the needs and geographical areas of the proposed area technical schools.

Mr. Cooper received his Baccalaureate degree from California, Pa., State College in 1939 and his Master's degree from the University of Pittsburgh in 1949. He began his teaching career in Gallup, N. Mex., where he became principal of an elementary school. In Pennsylvania he was an instructor of industrial arts and drafting, and served as a director of vocational education. In 1943 he joined the staff at the University of Pittsburgh as an area coordinator of industrial education. In 1950 he became a consultant to the Brazilian Government on vocational technical education. In 1956 he became state supervisor of trade and industrial education and served in this capacity until his death.

☐ *F. Sheldon Davis*, chief, division of vocational education of the Rhode Island State Department of Education, died at his home in Warwick, on April 3, 1961. Mr. Davis had been on the staff of the Department of Education for eighteen years, serving as chief of the division of vocational education since the position was established in 1951, and before that as supervisor of adult trade and industrial vocational education. During this time, vocational education in Rhode Island experienced considerable growth and expansion including the establishment of the state program on Practical Nursing in 1951, and the Vocational Technical School of Rhode Island in 1958.

☐ *Joy E. Mohrhardt*, teacher and supervisor in Toledo, Ohio, public schools for 36 years, died recently at Toledo Hospital. He came to Toledo in 1924 after graduation from Kalamazoo, Mich., Normal College. After brief teaching assignments at Arlington and Spring Schools, he became industrial arts instructor at Woodward High School. In 1948 he was named first industrial arts supervisor in the public school system, a position he held until June, 1960, when he retired because of ill-health.

Mr. Mohrhardt was president and a life member of the Ohio State Industrial Arts Association, and was a member of the Midwest and American Industrial Arts Associations, Toledo Teachers Association, and the Ohio and National Education Associations.

retirements . . .

☐ *C. R. Dixon*, director of vocational education at the Ithaca, N. Y., public schools, retired at the end of the school year. He was a graduate of Buffalo State Teachers College, taught mechanical drawing, and was made part-time director in 1930, and full-time director in 1948. He supervised industrial arts in the Ithaca public schools and apprentice training and occupational extension. He spent 38 years in teaching at Ithaca.

☐ *Harry L. Crockett*, industrial arts teacher, Central High School, Phoenix, has retired after 37 years of service to the Phoenix Union High School system. He was honored by the Central District Industrial Arts Association on May 10, 1961, when he received a framed letter of testimony from the association and an Honorary Life Membership.

☐ *Ferdinand Rossy*, director, industrial arts program in Puerto Rico, has retired, effective September 15 of this year. Mr. Rossy spent 48 years in active service—25 as an industrial arts teacher (first manual training, then manual arts) and 23 years as general supervisor and director of industrial arts.

awards . . .

☐ *Richard H. Hagemeyer* was the recipient of the doctor's degree in Wayne State University mid-winter commencement. He received the B.S. degree from Bowling Green State University and the M.A. degree from the University of Michigan.

A former industrial education teacher at Fordson High School in Dearborn, he joined the faculty of the Henry Ford Community College in 1952 to make a survey of technical education needs in the Detroit metropolitan area. He organized and developed the Related Instruction Division of the Henry Ford Community College and now is the supervising coordinator of this division.

☐ *Dr. James Hastings*, chairman of the department of industrial arts student teach-

(Concluded on page 58)

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PERSONAL NEWS

(Concluded from page 56)

ing at State University College of Education, Oswego, N. Y., was the recipient of the New York State Steering Committee for Industrial Arts "Outstanding Service Award" at the committee's spring meeting in Elmira.

He was presented with a citation stating: "Dr. James R. Hastings is hereby recognized for his outstanding contributions in the field of Industrial Arts Education and in particular for his notable service in the preparation of the New York State Vocational and Practical Arts Association Viewpoint magazine."

☐ *Siegfried Mueller* won third place in national judging conducted by the American Foundrymen's Society. This award was made in the molding division of competition in the American Foundrymen's society Robert E. Kennedy Memorial Apprentice contest held in Chicago the week of April 11, 1961. He is a graduate of Chicago Teachers College in the industrial education curriculum in foundry, and is currently teaching at the Manley Upper Grade Center, and is presently working for the master's degree in the teaching of industrial education at CTC. His award consisted of $50 and a certificate of merit.

☐ *Earl M. Weber,* associate professor of industrial arts education, State College, Millersville, Pa., received his doctor of education degree from Pennsylvania State University on June 10, 1961. His dissertation was entitled "A Comparative Study of Industrial Technology Programs in American Colleges and Universities, with Industrial Arts Teacher Education and Technical Institute Programs."

☐ *Dr. Paul T. Hiser,* professor of industrial arts at the New York State University College of Education at Oswego, was cited for outstanding accomplishments during 12 years of service to the American Council on Industrial Arts Teacher Education.

appointments . . .

☐ *Harry Lewis,* co-ordinator of vocational curriculum development in the Bureau of Curriculum Research for the past ten years, has been appointed director of trade and technical education for the New York City school system.

Mr. Lewis is a graduate of electrical technology and the department of electrical engineering of Pratt Institute. He is a member of the American Institute of Electrical Engineers. He holds bachelor and master degrees in vocational education from the School of Education at New York University, where he is presently completing his doctoral thesis.

☐ *C. Robert Hutchcroft* has been promoted to the rank of full professor in the School of Education at the University of Michigan. He is professor of industrial arts education and a member of the staff of the Department of Vocational Education and Practical Arts.

☐ *Dr. Walter B. Jones* of the vocational teacher education division of University of Pennsylvania, at Philadelphia, was invited to spend the interim between spring semester and summer session, with representatives of other nationalities in a consultative mission with the UNESCO Secretariat in Paris, France, helping to prepare an International Recommendation in the field of technical education.

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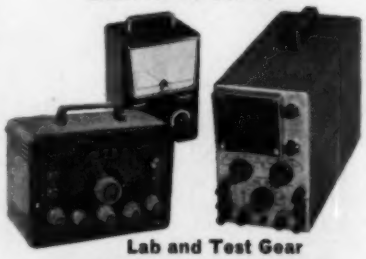
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associations

IDAHO I-A ASSOCIATION

The Idaho Industrial Arts Association held its annual meeting at Pocatello, April 21. Myron Thompson, president, presided.

The program was centered on the need for a state supervisor for industrial arts in Idaho.

Speakers included: Dr. William E. Mortimer, head, industrial and technical education department, Utah State University, Logan; Dr. William R. Biggam, assistant professor of industrial arts, University of Idaho, Moscow; and Dr. D. F. Engelking, State superintendent of public instruction, Boise, Idaho.

Newly elected officers are: president — Lee Williams, Montpilier; vice-president — Ammon Benson, Idaho Falls; secretary-treasurer — Jerry Ham, Jerome, Idaho.

NEBRASKA COUNCIL OF INDUSTRIAL ARTS TEACHER EDUCATORS

The annual meeting of the Nebraska Council of Industrial Arts Teacher Educators was held in Kearney in spring. At this meeting plans were made to prepare a publication containing information pertinent to industrial arts in the state of Nebraska. This publication will be sent to all industrial arts teachers and school administrators in the state.

The Nebraska State Industrial Arts convention and the Third Annual State Student Craftsman's Fair were held in Kearney at the same time. The Council discussed these functions and noted that the Craftsman's Fair would again be held in Kearney in 1962.

Kenneth F. Carlson, associate professor of industrial arts at Nebraska State Teachers College, Kearney, was elected president of the Council for the 1961–62 year; and Thomas L. Jones, assistant professor of industrial arts at the same college, was elected secretary-treasurer.

PHOENIX INDUSTRIAL ARTS ASSOCIATION

The Central District Industrial Arts Association held their annual dinner meeting on May 10, 1961.

John Lynch of Glendale Elementary Unit IV (immediate past president), and Harold Smith, superintendent of the Glendale Elementary Schools, were hosts.

The group took this occasion to present awards for the annual spring Industrial Arts Exhibit that was held in April.

This occasion was also used to honor Harry L. Crockett, industrial arts teacher from Central High School on his retirement, and the awarding of life membership honors to Bill Anderson, Clarence Hansen, and Sam May, for their outstanding service and contribution to the field of industrial arts.

Newly elected officers are: president — Richard Froese, Carl Hayden High School; first vice-president — O. C. Olson, Edison Elemetary School; second vice-president — George Svob, Washington Elementary School; secretary — Ed Aguirre, South Mt. High School; treasurer — George Waters, Hayne Machinery Company.

The first meeting of the fall term 1961–62 will be held October 11, 1961, at Carl Hayden High School when the new officers will be installed.

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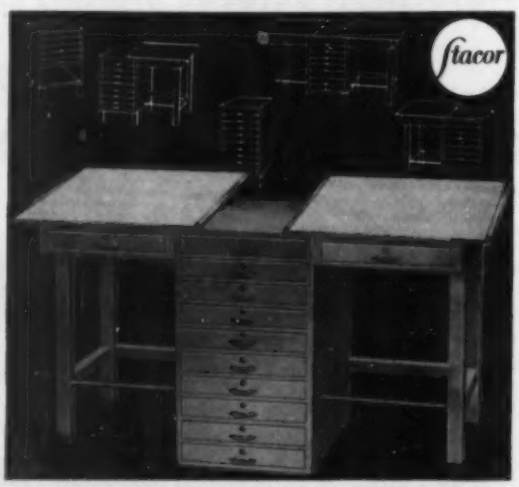

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PRESTIGE IMAGE

(Continued from page 27)

In the first place, at this age young men are encouraged to become more independent than young women and are, therefore, not as co-operative in assignments. Bluntly speaking, the girls were more anxious to conform by following the teacher's instructions and, so wrote more. Secondly, our data are consistent with many studies which indicate that sex-differences in perception exist. For example, women give richer descriptions than men, and are more concerned with social impact.[9] Finally, in a study of adolescents by the writer, it was found that girls tended to describe themselves in terms of what they were such as personality characteristics. In contrast, boys tended to describe themselves in terms of what they could do such as abilities and sports.[10]

The data in Table III support these cultural patterns, for the majority of items under "Areas of Difference" involve work-skill relationships.

Therefore, as the French would say, "Cherchez la Femme" ("Find the Woman") in any attempt to assess or change the negative public image of the industrial educator. It would be a mistake to limit action to the male population because a man's job is involved. The writer is reminded of a shirt advertising campaign which failed. Why? Subsequent research indicated that very few men buy shirts — this is done by their wives and mothers! All this underlines the social fact that in America, women are the standard-bearers of manners and culture and are, therefore, more sensitive to status and prestige.

Summary of Studies

Each of the three studies involved a different coeducational class of college students. The numerical total was distributed as follows: Study No. 1 — N 39; Study No. 2 — N 59; Study No. 3 — N 33; grand total — N 131. All three were interrelated. In the first study, industrial educators were ranked low in I.Q. On a scale of 1–10, the mean rank was 8.54 and resulted from consistently low ranks, since the majority ranked them in eighth or ninth place. Therefore, in the second study, students were asked to contrast the industrial educator with the one whom they had ranked in first place. A content analysis of the descriptive statements revealed that 66 per cent were

[9]Norman L. Munn, *Psychology* (Boston: Houghton Mifflin Co., 1956), pp. 312–13.

[10]Leonard A. Ostlund, "Environment-Personality Relationships," *Rural Sociology*, Vol. 22, No. 1, Mar. 1957, pp. 31–39.

(Concluded on page 62)

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PRESTIGE IMAGE

(Concluded from page 60)

unfavorable, 13 per cent favorable, and 21 per cent neutral. In the third study, subjects wrote a description entitled "The Typical IA–VE Teacher." Analysis in terms of sex differences, indicated that women wrote more in terms of personal-social areas, whereas the least differences were in the area of work-skill relationships. All these findings have important implications for the shortage of industrial educators.

In Conclusion

A scientific note of caution is in order. Since these were miniature studies, they should not be generalized widely. However, they ring true and suggest more elaborate research. Moreover, they emphasize important characteristics of the negative public image which function as predisposing factors in the contemporary shortage of industrial educators.

Because of high vocational mobility, the industrial educator is employable anywhere at any time. This factor, coupled with low academic prestige, predisposes him to leave the teaching profession when some precipitating incident occurs. It is an ironic comment upon our cultural values to consider that the same man, with the same qualifications, goes up the ladder of social prestige when he exchanges his cap and gown for a business suit!

James Bryant Conant has stressed the value of industrial educators in his two major studies "The American High School Today"[11] and in "Education in the Junior High School Years."[12] Perhaps when future citizens have some knowledge and training in the field, their opinions will change.

In addition, measures may be taken now in order to change public opinion. Adults may be made aware of the fact that the industrial educator faces a unique challenge in helping American students to realize their creative, artistic, and productive potentials. Internationally, underdeveloped nations look to the U.S.A. for industrial education co-operation which will help them to become self-supporting democracies. Unless we respond, others will.

In order to change the negative public image of the industrial educator, the following suggestions seem appropriate:

1. Support further research.
2. Tap the power of the press; present industrial education favorably.
3. Stress opportunities which industrial education training offers nationally and internationally.
4. Obtain the support and co-operation of the fair sex. □

[11] James B. Conant, *The American High School Today* (New York: McGraw-Hill, 1959).

[12] "Conant Attacks Stress on Frills by Junior Highs," *New York Times*, Oct. 9, 1960, p. 1.

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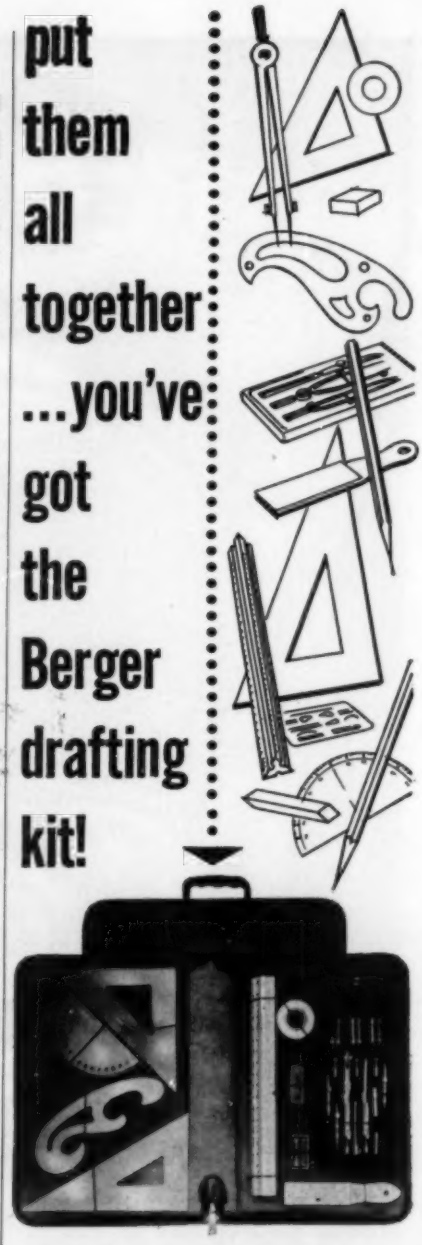

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(Continued from page 21)

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7. Arrange with the school superintendent for a satisfactory time to confer with him. Let the superintendent know in advance when visiting departments of industrial education under his administration. Request presence of the superintendent and principal.

8. Be dynamic and cause things to happen. Be an organizer, a leader, a promoter, and be diplomatic in public relations.

9. Have a philosophy. Take a stand and defend industrial education when needed.

10. Operate democratically, be unbiased, and render consultative service to general and specific instructional problems.

11. Have a comprehensive understanding of the science and technology of industrial education. Be abreast of current trends and make current materials and aids available for use in curriculum development and evaluation.

12. Know what is contained in the annual financial, statistical and descriptive reports. Be sure they are accurate and report industrial education as it actually operates.

13. Have an understanding of the total educational program in the public schools, recognizing that industrial education needs general education as a basis.

14. Encourage selected schools to establish pilot and demonstration centers for experimental purposes.

15. Support new and emerging programs by providing financial incentives for a limited time.

16. Provide staff assistance when an emerging or experimental program is to be promoted or supported by the department.

17. Distribute professional materials through means which will promote their most effective use, such as personal presentation, discussion, and demonstration.

18. Encourage and assist schools in developing a program of continuous evaluation and in utilizing the findings for improving the instructional program.

19. Co-operate with teacher education institutions in their pre-service and in-service programs in developing concepts of evaluation in practical situations which involve students.

20. Initiate, conduct, and co-ordinate research relating to the instructional program.

21. Assist in the in-service education of personnel by providing consultative services and resource materials to local schools. □

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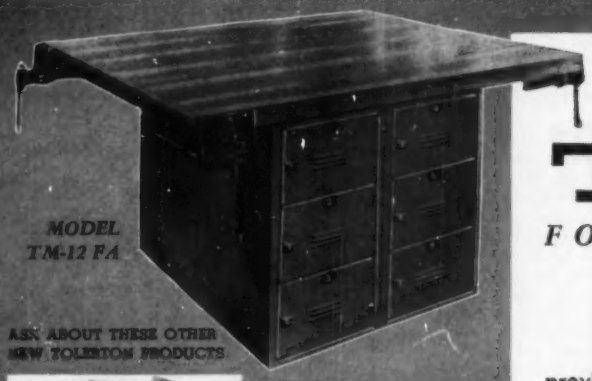

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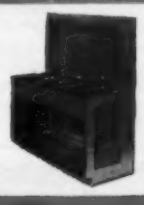

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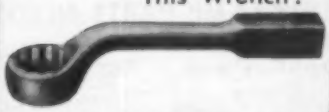

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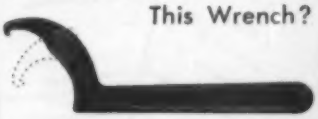

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new books

The Automobile Transmission and Drive Line

By James S. McGrath. Cloth, 376 pp., 6½ by 9½ in., illus., $7.95. Chilton Company, Philadelphia 39, Pa.

A new title in the publisher's popular "Automobile Mechanics' Series," this text comprehensively covers clutches; clutch service; standard transmissions; transmission trouble diagnosis and corrective procedures; transmission overdrives; propeller shaft and universal joints; final drives, differentials, and rear axles. Mirroring technological advances in the automotive industry as they relate to this phase of automotive maintenance, the work strives to provide the secondary student with a thorough knowledge of principles as well as general and specific skills. In narrative and illustrations there is stress on technical information, up-to-date servicing methods, and how to use the most current types of analyzing equipment.

Electronic Drafting Handbook

By Nicholas M. Raskhodoff. Cloth. 402 pp., 6¼ by 9¼ in., illus. $14.75. The Macmillan Co., New York 11, N. Y.

A handbook of the principles and practices of electronic drafting: "a newcomer to the engineering drafting field." After an introductory chapter on "the new profession of electronic drafting," there are three basic chapters on electronic components, mechanical components, and materials. The remaining 11 chapters in two parts (general electronic drafting techniques and special electronic drafting techniques) are devoted to advanced aspects of the subject. Although the book is clearly written and very well illustrated — there are 74 complete tables and 186 drawings and figures — it is usable mainly by post-high, technical students who desire a specialty in this area. As such, however, it seems very comprehensive and authoritative.

Architectural Drafting

By Herbert F. Bellis and Walter A. Schmidt. Paper, 118 pp., $2.95. McGraw-Hill Book Co., New York 36, N. Y.

This introductory course is addressed to high school students and adult laymen who desire to master the basic principles and techniques of drawing for small building construction. The book opens with the simplest orthographic methods and proceeds in a logical way to outline the drawing of construction details and the use of conventions and symbols. Two major projects are provided in the preparation of drawings for a frame garage and a cottage. Additional chapters provide information on the preparation of drawings for small masonry and frame-roof buildings, and the writing of simple specifications. It appears to be eminently adaptable.

Dictionary of Mechanical Engineering

By Alfred Del Vecchio. Cloth, 346 pp., illus., $6. Philosophical Library, Inc., New York 16, N. Y.

A comprehensive dictionary and sourcebook with prime definitions in the field of architecture, automatic controls, engineering mechanics, fuels and combustion, and power plants, along with related definitions in the field of basic electricity, heat treatment of metals, basic mathematics, and welding. Written "for the practicing engineer and students and teachers

(Concluded on page 66)

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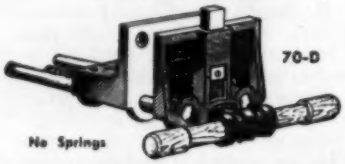

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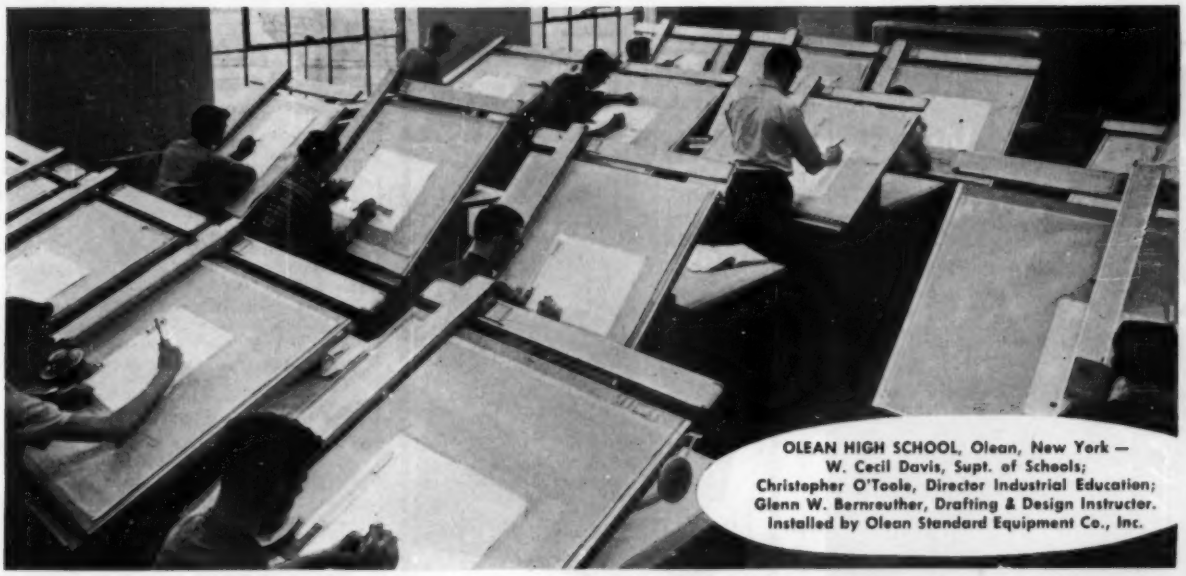

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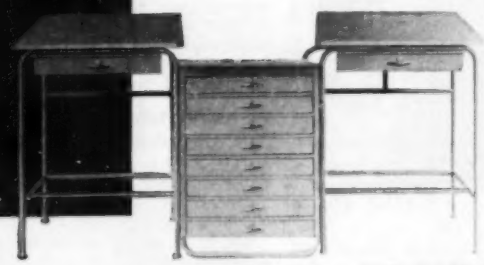

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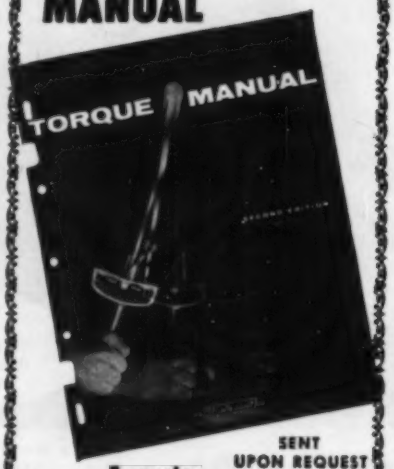

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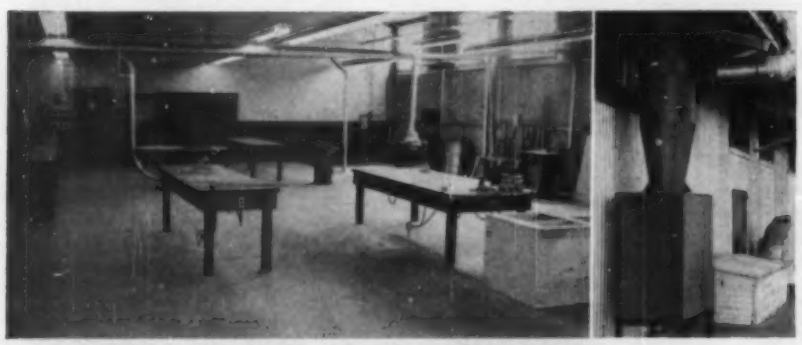

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NEW BOOKS

(Concluded from page 64)

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Fundamentals of Carpentry — Vol. I

By W. E. Durbahn. Cloth, 383 pp., 5⅝ by 8½ in., illus., American Technical Society, Chicago, Ill.

This third (1961) edition of the well-accepted, two-volume approach to carpentry retains the aim of the original: to present usable knowledge, as well as practical skills, in the trade. New developments in hand and power tools, insulation, blueprint reading, etc., are incorporated in the revision.

The Instructor and His Job

By Homer C. Rose. Cloth, 280 pp., 5¾ by 8½ in., illus., American Technical Society, Chicago, Ill.

A brief but eminently practical book on the techniques of teaching intended to serve the industrial educator. Highly appealing chapters include those on: some facts about learning, influences on learning, improving the learning situation, and testing and measuring. The work also has, in plain language, advice on lecturing and discussing, questioning, demonstrating, using aids, and preparing courses of study and lesson plans. Well illustrated with pictures and sketches, here is another excellent addition to the growing library which relates the principles of the teaching-learning process specifically to the content and techniques of industrial education.

Course Construction in Industrial Arts and Vocational Education

By J. W. Giachino and Ralph O. Gallington. Cloth, 234 pp., 5¾ by 8½ in., illus. American Technical Society, Chicago, Ill.

This second edition of the 1954 guide to "organizing instructional material into logical and effective teaching units" incorporates suggestions made by teachers and students using the book. Material in some chapters has been further expanded or clarified and a new chapter on developing work units has been added. It offers a great deal of practical guides toward developing and improving courses of study.

Tenth Yearbook 1961: Graduate Study in Industrial Arts

Co-edited by Ralph P. Norman and Ralph C. Bohn. Cloth, 164 pp., 6 by 9¼ in. McKnight & McKnight Publishing Co., Bloomington, Ill.

The tenth annual yearbook of the American Council on Industrial Arts Teacher Education reports on "graduate study in industrial arts" in three parts: (1) evolution of industrial arts in public education; (2) industrial arts graduate programs in action; and (3) a look ahead. The co-editors, Ralph P. Norman and Ralph C. Bohn of the department of industrial arts of San Jose State College, state that the first part serves as a general historical identification of industrial arts in public education served by graduate program; as such, it represents a concise historical review to part two's analysis of past and present graduate programs. The co-editors' summary, "A Look Ahead" highlights the necessity to adjust course content and instructional methods to established objectives through shifting programs for graduate degrees and through vitalized research for these degrees. (The study states that "research holds the key to the future of industrial arts.)

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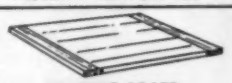

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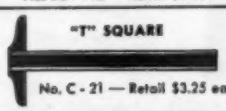

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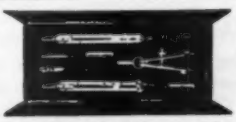

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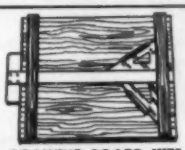

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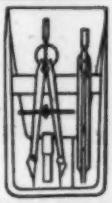

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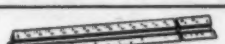

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FOR BEGINNING TEACHERS

(Continued from page 38)

tinual improvement of the physical aspects. This should be in writing and a copy should be filed with your principal or other supervisor. The following few points are merely suggestive: future rearrangements, additions, painting, resurfacing, new equipment, lighting, soundproofing.

9. **Possibilities About Town.** Have you contacted individuals and firms in the town who may be co-operative in your program? Are there any establishments to which a visit would be educational for the students? Sometimes, with the right approach, it is possible to borrow materials or tools that will add considerably to your teaching. Sometimes gifts are made by interested persons or organizations.

10. **Adult Class.** Have you thought of organizing an adult evening class? Many men and women are most eager to do shop work under the guidance of a teacher and without reference to day employment in industry. This is one of the most effective ways of "selling" your work to the community. Often it results in added equipment. Of course, such a program must have planning and careful organization.

11. **Craft Club.** Is there a need in your school for a craft club or extra-curricular work connected with the shop? This, also, is a good means of "selling" your work to the students. Anything you will do to encourage home workshops for pupils or parents will be beneficial.

12. **Advertising.** Your work, as to objectives and practices, must be given publicity. If you have something worthy to offer, you should purposefully and intelligently advertise this to all students and to the community. Such procedure should be as continuous as possible. Remember that the school paper, the local paper, the radio, etc., are appropriate avenues.

13. **Aims and Objectives.** Have you formulated aims and objectives for each of your courses? Put these in writing to show any person who may be inquisitive. They will be extremely valuable when you have visitors. The principal would appreciate these statements.

14. **Examples of Your Work.** Let the students see some examples of your own work early. Show them that you can do more than talk in this field, that you're skillful as well as informed. To have a display ready the first day of school will be a big factor in "selling" yourself and your work.

15. **Conferences.** If you are in a small system you may have other teachers constantly asking questions concerning construction or manipulation in

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connection with their classes. This will be especially true of the elementary teachers. Advertise one or two set hours each week when you will be pleased to answer questions, help get materials ready, and help plan their work. This will save you time and will give you a firm footing among the teachers.

16. **Constructing for Others.** Be wary about making something for anyone and everyone of the teachers. Unless you watch this practice at the outset you will soon be spending all of the spare time in this way. You should not be entirely independent, but you should be able to say "no" when your available time is encroached upon.

17. **Materials Fee.** If you must charge the students for materials, set up the system before any projects are made. One method is to have a "Project Permission Card" which the student fills out before he can begin on any project. This gives you a check even before the project has been started. This would be followed up later, of course, by a detailed Bill of Materials.

18. **Displays.** See whether it will be possible to have a display place in school where examples of work done in the shop can be exhibited. Perhaps a corner of the library can be used or a window section or wall case. By having exhibits which are regularly changed you will build up interest while presenting something that is educational.

19. **Bulletin Board.** Remember to utilize your bulletin boards to the utmost. The effectiveness of bulletin material is dependent upon a small amount at a time and constant change. One method of managing this responsibility is to appoint a student chairman whose duty it is to change the bulletin board material every week. He will keep you aware of the necessity of getting new materials.

20. **Price List.** As soon as possible post a price list of the materials that must be paid for by students. They should see this before beginning their projects. There will then be little excuse for their making things which they cannot afford.

21. **First Aid Kit.** Be sure a first aid kit is present and in good condition on the first day of school and everyday thereafter. The smallest personal injury, even a scratch, should receive attention. Are you aware of the procedure to follow in treating the various accident cases likely to occur in the shop?

22. **Safety Rules.** Have you made out the safety rules or safety specifications for using the tools and machines about the shop? Several industrial firms, schools and city and state departments of industrial education publish statements or bulletins concerning safety as applied generally in our work or to specific processes or power machines.

23. **Discipline Cases.** Take a firm stand with early discipline cases that arise. Almost invariably the students will "feel you out" during the first few class periods. Your position should be made known at once and there should be little question as to who is in charge. Individual cases will have to be handled differently, but they should be handled directly. Discipline cases should not make you lose your friendly attitude.

24. **Budget.** Have you inquired as to whether you will have a budget to manage? What are the procedures you must go through in order to spend money? How much may you spend? Is it a matter of specific or blanket requisition, or may you buy for cash when necessary? These are a few pertinent financial questions that should be answered to your satisfaction early.

25. **Grouping Students.** Are you going to group your students? This may be done by IQ, by the amount of earlier shopwork, by the grade or year in school, or any of several other methods. □

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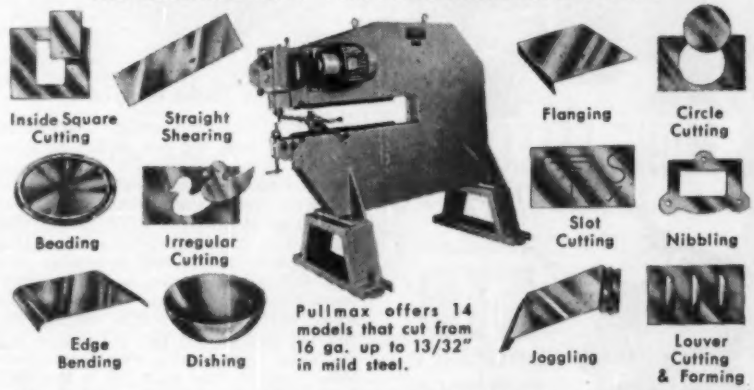
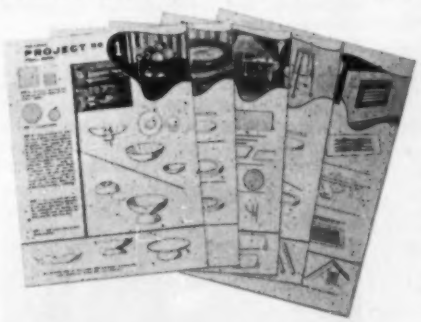
THE MACHINE THAT PERFORMS MORE OPERATIONS



NEW Complete Metal Shop Projects for Students



Colleges, Trade Schools and High Schools are recognizing the importance and potential value of Pullmax for the future of industry. Therefore, they are fast installing Pullmax Machines in their Manual Training Shops.

For that reason American Pullmax has spared no expense to develop a Student Project Training Program. After the student has covered this program, he will be an accomplished Pullmax Operator and Instructor.

THE STUDENT PROGRAM CONSISTS OF—

1. Pullmax Machine of size and capacity required.
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Height — 25", diameter — 26", inside diameter — 10", BTU per hour — 120,000, gas supply line — 1", max. capacity — #16 crucible, blower — #1202, 1/25 HP, 110 V, shipping weight — 375 lbs.

Johnson 510 furnace $239.00 with #10 crucible and pilot burner.

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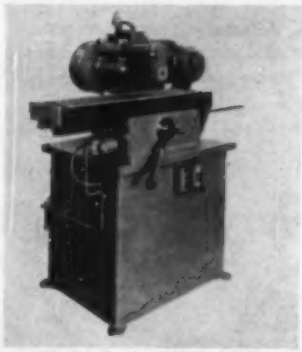
equipment

milling machine From the U. S. Burke Machine Tool Company, a small, versatile mill, developed for heavy duty performance, adapting its standard No. 1 U. S. Half/Mill with a heavy box type table and slide. Designed to provide rapid



U. S. Burke Half/Mill

production rack and pinion longitudinal hand table feed, the new mill adaptation features both air-hydraulic and manual rack and pinion longitudinal table feed; it is also available with manual feed alone or with air-hydraulic or full hydraulic feed alone. It is capable of high performance slotting, sawing, face milling, keyway cutting, slab milling, boring, and many other operations, and provides selective spindle speeds up to 5000 r.p.m.'s. Vertical rise and fall feed on the pictured unit is 4½ in., cross feed 6 in., with longitudinal feeds available from 16 in., to 36 in. Selection of table sizes range from 6½ by 27 in., to 10 by 54 in. working surface.

For further information on half/mill adaptations and for illustrated descriptive literature, write to the manufacturer.

(For further details encircle index code 0701)

new feature on vise From The Columbian Vise & Manufacturing Company, a graphite bronze thrust bearing on each model of their Woodworkers' and "Wide-Side" vises, which is known to con-

Thrust Bearing

stantly lubricate the screw head without oil or grease. It also absorbs thrust, assuring easy positive operation while preventing wear and eliminating end play. Because of this bearing, Columbian Vises can be held more securely with less pressure. Bearings are used on 16 different Woodworkers' and four "Wide-Side" vises. For complete data write to the manufacturer.

(For further details encircle index code 0702)

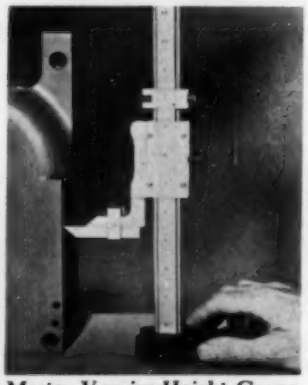
tool trade-in program From Rockwell Manufacturing Company and distributors of its Delta and Walker-Turner industrial tools has come an announcement of the establishment of a trade-in program for purchase of new drill presses.

To implement its trade-in program, Rockwell has established a uniform guide for use by its distributors in determining the trade-in value of older drill presses and a census form to establish a drill replacement schedule. Suggested trade-in values are high, often equal to half the original cost of the tool, because of the large market for used drill presses in small commercial shops.

Please write for further information on the census and replacement schedule to be set up between the user and Delta or Walker-Turner distributor to spread modernization over several months and to get rid of the oldest, least productive tools first.

(For further details encircle index code 0703)

new series of height gauges From The L. S. Starrett Company, the Master Vernier Height Gauges which combine correct balance and weight for easy handling in applications where a lighter weight gauge is preferred. Available in 12-inch and 18-inch sizes, the new height gauges feature a new, long, 50-division vernier with widely spaced, easy-to-read graduations to simplify setting and reading



Master Vernier Height Gauge

without the aid of a magnifying glass. The vernier scale is flush-fitted in the same plane as the main scale for exact alignment of matching lines on bar and vernier with no parallax problems to cause reading errors. Other features include: no-glare Satin-Chrome finish on all reading surfaces; master bar hardened and stabilized for rigidity and lasting accuracy; combination straight and angular ways for positive alignment of bar and slide; extra long slide for greater bearing surface; natural grip hand fitting base, cut-away base for full range, direct reading from base. Complete information available on request.

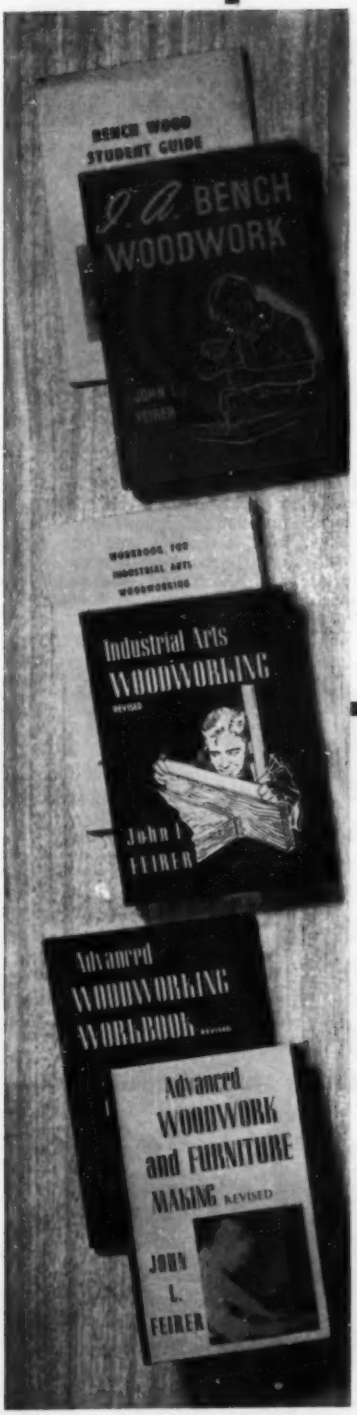
(For further details encircle index code 0704)

box and pan brake From Di-Acro Corporation, the Spartan Model No. 24 Box and Pan Brake, designed to give accurate, and long service. Its eccentric shaft with needle bearings has a 1¼ in. diameter, and material can be clamped securely assuring the maximum in rigid construction. The hardened shaft has a positive stop, and stradle mounting of the connecting arms to the box finger mount bar eliminates binding when clamping material. The reversible folding blade measures 6 by ¾ by 24 in., resulting in more rigidity and accuracy, especially when working to full capacity. Box fingers are stamped for easy identification and are made of hi-alloy, heat treated steel that hardens with use. All ten fingers

(Continued on page 72)

your complete woodworking program

. . . Written by John L. Feirer



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I.A. BENCH WOODWORK (1959)

This introductory text contains fifty-four basic units, providing teaching flexibility and offering a sound learning program.
The text objectives include; teaching students about the woodworking industry, how to design, plan and complete a project; basic hand skills; safety in woodworking; consumer values and conservation of natural resources.
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SHOP EQUIPMENT NEWS

(Continued from page 70)

are undercut ½ in. for forming boxes and chassis with a lip or flange across the top or bottom. The box finger mount bar measures 3 by 2½ by 24 in. and will not bow, bulge, bend or break, while holding the material firmly to the bottom plate even when forming to the full 16-gauge mild steel capacity.

Write to the manufacturer for information on the budget stretching possibilities offered through the purchase of one of eight different Machinery Package deals on Di-Acro Equipment. The Spartan Model 24 Brake is included in all eight of these deals.

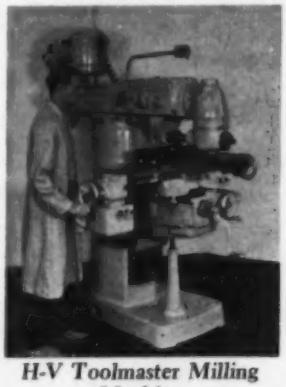
(For further details encircle index code 0705)

saw blades From Skil Corporation, "Economy Packs" containing ten Skil diamond arbor combination saw blades packed in a convenient carton. The packs are available in three popular blade diameters — 6½ in., 7¼ in., and 8¼ in. Further information regarding prices, etc., may be obtained from Skil Corporation.

(For further details encircle index code 0706)

Economy Pack Saw Blades

milling machine From The Cincinnati Milling Machine Company, a new turret type milling machine — known as H-V — with a spindle head designed for horizontal milling with arbor mounted cutters, and for vertical and angular milling with the spindle head swiveled and the arbor support removed. To save setup time, the machine may be equipped with any one of three different Toolmaster vertical heads on the opposite end of the overarm. Then to quickly change from horizontal to vertical or angular milling, four bolts are loosened, and the overarm and turret base swiveled as a unit to locate the vertical head over the table.



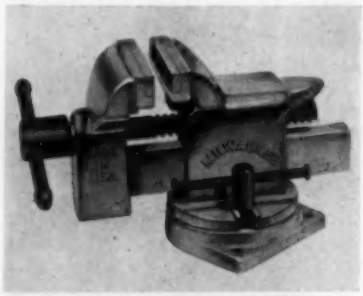
H-V Toolmaster Milling Machine

The Cincinnati Toolmaster line consists of five styles (1B, 1C, 1D, 1E, and H-V) differing primarily in the type of milling head and drive. For complete information, write for Catalog No. M-2110, which includes H-V Toolmaster fold-out, No. M-2229.

(For further details encircle index code 0707)

vise From Milwaukee Tool & Equipment Company, the No. 550 Economy Vise, offering unusual quality at low prices. Featuring a jaw width of 3½ in., and a jaw opening of 4 in., the rugged vise offers removable, replaceable serrated steel face jaws; swivel base with positive lock; one piece screw forged from steel screw stock; precision machining throughout; heavy, solid steel slide bar, cold forged "gaff-standing" handle balls; large work surface with horn and pipe jaws. Vise weight is 12 lb.

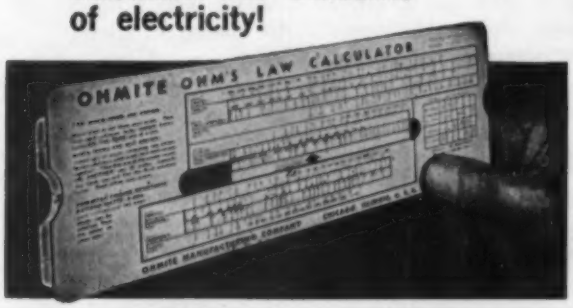
(For further details encircle index code 0708)



Milwaukee's Economy Vise

(Continued on page 74)

A time-saving calculator for students of electricity!



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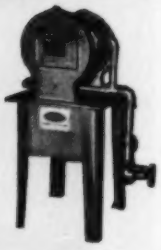

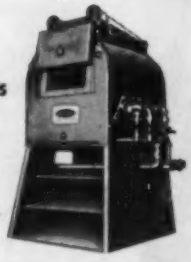

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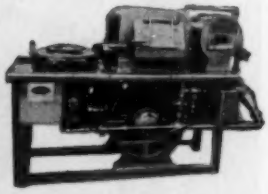

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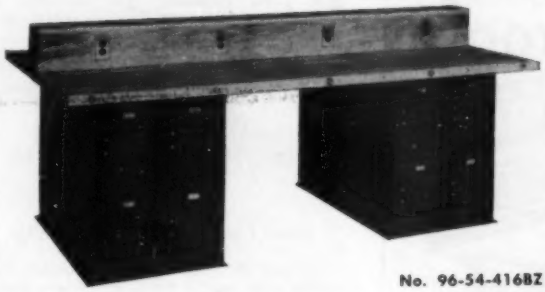

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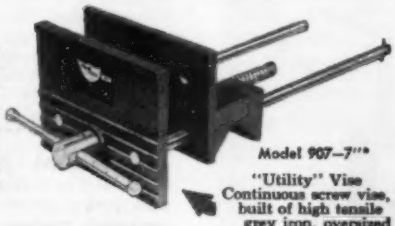

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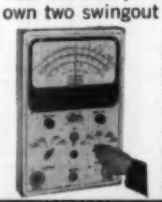

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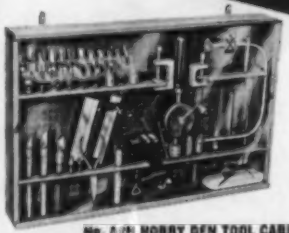

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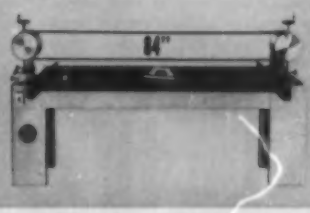

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Handles abrasives ⅛" to 3" dia. with quick-change spindles. Rapidly, accurately sands wood, grinds metal and plastics internally and externally. Ideal for scroll-grill work, patterns, dies, finishing castings and stampings. Accurately bevels to 45°. Table 20" x 20", tilts 2 ways.

Write for literature.
BOICE-CRANE COMPANY
933 W. Central Avenue • Toledo 6, Ohio

SHOP EQUIPMENT NEWS

(Continued from page 72)

milling machine table From Palmgren Steel Products, the new No. 85 Dual Cross Slide Milling Table. The new

Dual Cross Slide Milling Table

Palmgren No. 85 can be furnished with 10 by 6-in., or 12 by 6-in. table top surface. Either size has one longitudinal T slot and three equally spaced cross slots. Transverse travel is 4½ in., and longitudinal travel is 6 in. Easy-to-read dials are 1¼ in., diameter, graduated in thousandths. Balance cranks are removable. The large square base has four mounting lugs and ⅝-in. keys and keyways for machine slot mounting. The Palmgren No. 85 table is ideal for use on milling machines, grinders, as well as laying out work. Complete information covering the new table will be furnished upon request.

(For further details encircle index code 0709)

improved 7-in. grinder From Rockwell Manufacturing Company, announcement of advanced safety devices plus other features in the newly improved Walker-Turner 7-inch, ½ h.p. grinder, which is available in both bench and pedestal models. A notable feature is the unit's

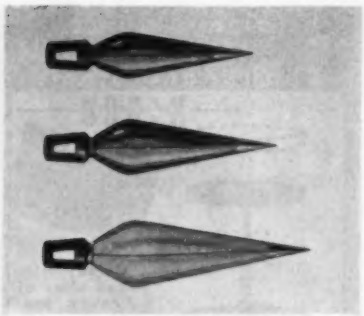
Improved 7-in. Grinder

patented "Twin-Lite" safety shields containing double-strength, shatter-proof glass to protect the operator's eyes. Inside the shields, bayonet-type bulbs are shaded to prevent glare while illuminating the face and both sides of the wheel. Wheels are balanced to 1/10 inch-ounce.

For further information on additional safety features, and other points of interest concerning design, motor, tool rest adjustments, etc., please write to the manufacturer.

(For further details encircle index code 0710)

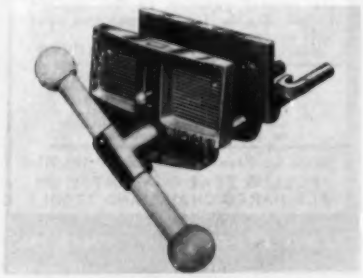
plumb bobs From Stanley Tools, division of The Stanley Works, a new line of high-quality plumb bobs for the skilled craftsman, mechanic, and homeowner. The new plumb bob features a long, slim-line body, bright with red enamel, with an easy-to-sight, full-view end point and comes in 5 oz., 8 oz., and 12 oz. sizes. A new cap design with body and cap cast in one piece makes it easy to attach the



Stanley Plumb Bobs

cord; cap won't loosen, can't be misplaced. The replaceable hardened steel tip is nickel-plated to prevent rust. For further information write to the manufacturer.
(For further details encircle index code 0711)

woodworkers' vise From Wilton Tool Mfg. Company, Inc., the new vise designed especially for elementary school



Woodworkers' Vise

shops. Known as Model No. 86, it has a shipping weight of 11 lb. The jaw size is 3 by 6½ in., and the maximum opening is 7 in. The new vise offers several attractive features, and is priced low enough for budget-minded elementary school shops. Complete information on Wilton's new No. 86 Woodworkers' Vise and the complete line of other Wilton Vises is available by writing to the manufacturer.
(For further details encircle index code 0712)

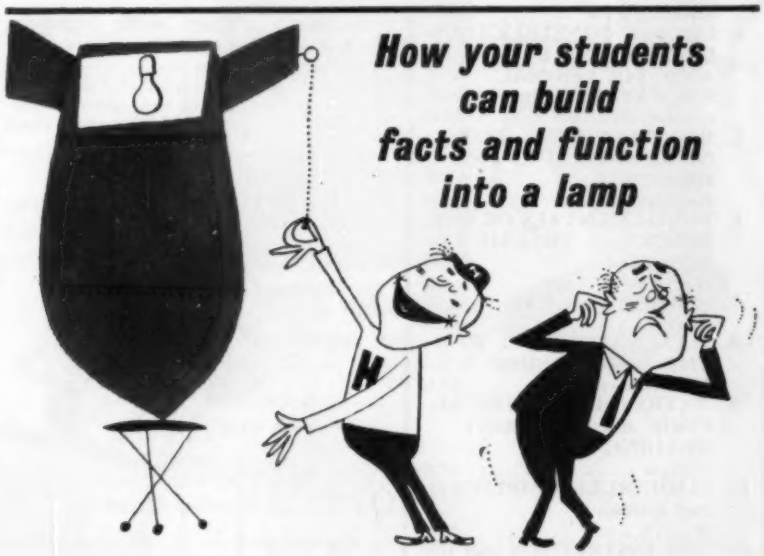
folding legs From Emco Specialties, Inc., furniture legs designed for easy storage and used for ping pong, banquet, card and train tables or display racks, as well as for the do-it-yourself and home workshop projects. May be used for new furniture or to renovate older pieces. The set of four legs is complete with screws and nonmar tips. Many styles are available in wrought iron and wood, satin black and satin brass, nonchip metal finishes, and natural wood finishes. Furnished at special discount to schools ordering 12 or more sets.

Available also are base brackets and scroll dividers for bookcases, end tables, and shelf and room dividers. For complete details write to the manufacturers.
(For further details encircle index code 0713)

aluminum corner sections From Reynolds Metals Company, these versatile aluminum corner posts to make it possible for joining plywood at right angles by merely fitting the plywood panels into open grooves on each side of the aluminum section and screwing or gluing them in place, making a perfect, tight corner. The sections can be extended to serve also as sturdy legs. The corner sections available from hardware and building supply outlets, come in eight foot lengths to match any cuts made from a standard 4 by 8-ft. plywood panel. They are fluted to match the design of Do-It-Yourself aluminum sliding door track, and can be cut with regular hand tools. Groove sizes are available for three plywood thicknesses, ¼, ½, and ¾ inch.
(For further details encircle index code 0714)

Aluminum Corner Sections

(Continued on next page)



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SHOP EQUIPMENT NEWS

(Continued from previous page)

furnace with additional combinations From Johnson Gas Appliance Company, their No. 510 Furnace, previously equipped with the standard No. 10 crucible, is now available with two additional combinations. The company is now stocking No. 16 crucibles and the No. 10 bottom-pour type for use with the No. 510 Furnace. The metal is ladled from the No. 16 crucible, and the two No. 10 crucibles can be removed with tongs when desired. The two new combinations are available to school shops who wish to order these items in addition to the standard No. 10 crucible. Further information on combinations and prices available upon request.
(For further details encircle index code 0715)

welding screen with hangers From Frommelt Industries, Inc., ruggedly constructed carrying handles which double as convenient loops for hanging the screens, have been included on their Spa-Fla wrap-around welding screens. Illustration shows

Welding Screen

how compactly the Spa-Fla screens can be rolled and transported on welding cart or by hand. Screens are available in seven standard sizes ranging from 18 by 36 in., to 72 by 108 in., with UL Approved covers in duck or weld-tex vinyl coated glass cloth. Catalogs and fabric samples are available upon request.
(For further details encircle index code 0716)

laboratory ovens From General Scientific Equipment Company, three models with thermostatic control for drying, baking, sterilizing, evaporating, heat treating,

(Continued on page 78)

Laboratory Oven Model QL-27

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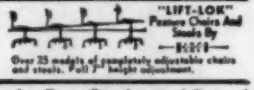

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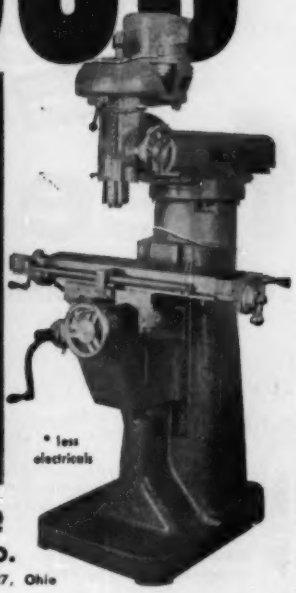

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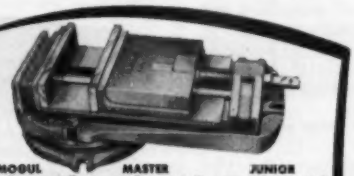

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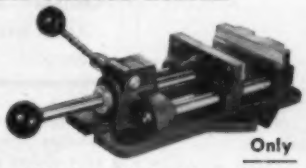

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SHOP EQUIPMENT NEWS

(Continued from page 76)

annealing, and testing. Features all steel interior as well as exterior, with gasketed doors, air cell asbestos insulation, full length piano hinges, and exclusive shelf support design. Shelves are nickel plated, and easily adjustable for height. Red pilot light indicates on or off. Damper controlled air circulation. Additional features include rubber feet, light gray hammerloid finish, mercury thermometer, and six foot cord and plug. For complete information on Models QL-20, QL-27, and QL-20C, please write to the company.

(For further details encircle index code 0717)

safety shop coat From Can-Pro Corporation, the coat designed to minimize the possibility of accidents in the shop. Safety sleeves are tapered with no loose cuffs, straight back has no belt that can catch in machinery, safe laundry-proof metal snap fasteners open quickly in emergency, and sewed-down micrometer or small instrument breast pocket which cannot become caught in moving machinery is designed so contents will not fall out. The coat features angle pockets with no flaps, and double thick bottoms for longer wear. The new Safety Shop Coat is of mercerized and sanforized all cotton washable material, in regular weight or light weight. Available in six colors, and sizes 34 to 56. Free circular describing these and additional features available on request.

(For further details encircle index code 0718)

miter clamp From Abernathy Vise and Tool Company, this device — called the Mitre-Master — having a wide range of applications in wood, metal, and plastics fabricating industries, consists of two screw clamps, the triangular frames of which are hinged to each other so as to hold the vises in the same plane yet permit them to swivel in relation to each other around a common center. Pieces held in the vises thus can be brought into contact with each other at any desired angle, and will remain in fixed position while being machined, fastened, or otherwise worked upon. The Mitre-Master can also be used as a drill press vise or for machine setups. Mitre-Masters are useful to industrial-arts classes and to the home craftsman, in addition to their use in industry. The tool is precision made of fine aluminum alloy, carefully machined and finished. For full information, write to the manufacturer.

New Design Miter Clamp

(For further details encircle index code 0719)

(Continued on page 80)

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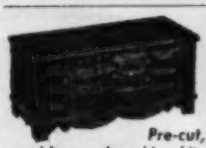

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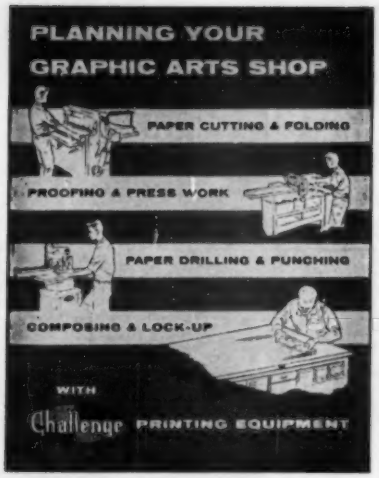

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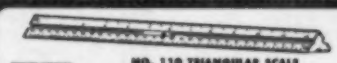

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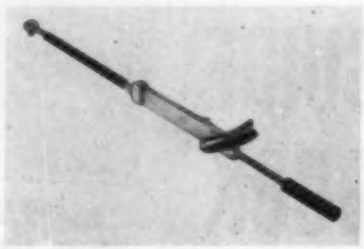
SHOP EQUIPMENT NEWS

(Continued from page 78)

torque wrench From P. A. Sturtevant Company, their new high capacity torque wrench for direct reading up to 600 foot-pounds of torque. The model number for this new torque wrench is S600. One operator need apply only 120



Torque Wrench

pounds of pressure to obtain 600 foot-pounds of torque and 60 pounds of pressure to exert 300 foot-pounds of torque. This instrument weighs less than 17 pounds and has a quick disconnect center section which allows easy shipping or storage. For detailed information, please write.

(For further details encircle index code 0720)

drafting equipment From The O. A. Olson Manufacturing Company, a self-contained and portable drafting board with parallel blade and storage compartment. The unit, called the Ames Draft-Pak, has

Portable Drafting Board With Storage Compartment

(Continued on page 82)

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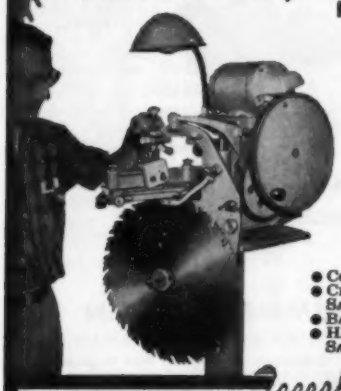

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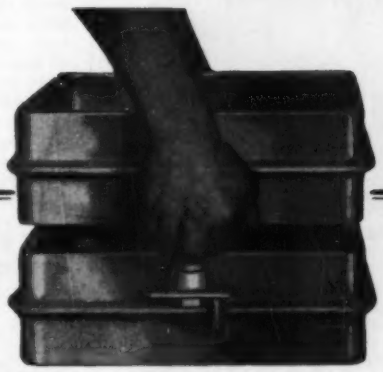

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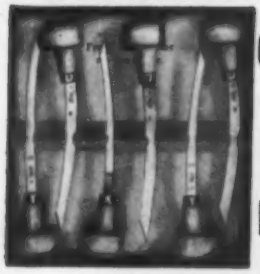

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SHOP EQUIPMENT NEWS

(Continued from page 80)

a reversible drafting surface so that the blade and drawing surface can be put inside the case for storage or transporting. Most useful where permanent drafting table and/or storage facilities are limited, or as a check-out unit for student make-up work or extra credit work. The unit is available in two sizes — 12 by 18 in., capacity as well as 18 by 24 in. For information on prices and conditions under which the product can be given a trial, write to the manufacturer.
(For further details encircle index code 0721)

new design drawing table and desk combinations From Stacor Equipment Company, this "Coordinate Group" provides a complete working unit with maximum convenience and efficiency for the draftsman. The "floating board" drafting table has the Stacor Toe-Touch Pedals that give complete control from a seated position of every board height from 30 to 45 in., and any angle from 0 deg.

Drafting Table and Desk Combination

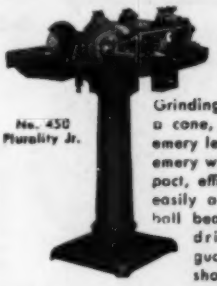
to 90 deg. The drawing surface is a non-glare Lino-Draft top, washable, resilient, and self-sealing. One side of the "L" unit is a desk with color-harmonized, plastic desk top with large, shallow, tool and catalog drawers having smooth-gliding nylon bearing suspension and rubber bumpers. Tubular legs have floor leveling devices; handles are brushed chrome; and there are three electrical outlets. The desk, drawing, and storage units which make up the Stacor "Co-ordinate Group" are fabricated from lifetime service steel and finished in two-tone baked enamel. Catalog and complete details are available from the manufacturer.
(For further details encircle index code 0722)

combo socket set From J. H. Williams & Company, the "Combo" Socket Set consists of seven basic driver parts for making many different drive combinations,

Combo Socket Set

from a flexible ratchet head to a sliding Tee-Bar. Eleven socket sizes range from 3/8 to 1 in., by sixteenths. The combo set features sockets made by Williams' newly developed cold impact extrusion process.

TOOLS ALWAYS SHARP WITH PLURALITY OILSTONE TOOL GRINDERS



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Grinding can be done on a cone, coarse or fine or emery leather stropping or emery wheels. Unit is compact, efficient, serviceable, easily accessible and has ball bearing direct motor drive. Especially guarded for school shop use. Details on request.

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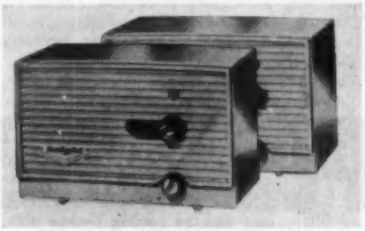
(For further details encircle index code 0723)

drawing pen set From Alvin & Co., Inc., the No. P395/C Draftech Fountain Pen Set which comes complete with pen, rubber nib wrench and 6 interchangeable drawing point sections, in line widths from

Drawing Pen Set

Superfine to Extra Broad. It features a transparent window and a permanent built-in refill cap. Streamline design with chrome, the spring clip is featured for easy carrying. Each interchangeable section has a precision designed stylus guide for smooth, efficient operation. Many other fine features included to make ruling, lettering, tracing, or writing easy and efficient. The set is packed in a carrying case with separate compartments for each unit. For further information write to the manufacturer.
(For further details encircle index code 0724)

wireless intercom equipment From Allied Radio Corporation, first wireless intercom system offered in low-cost kit form, featuring a highly efficient "squelch" circuit that prevents power line noise and static during "standby." An ad-



Knight-Kit Wireless Intercom

justable frequency control permits setting up separate systems on different frequencies to operate independently of one another. Represents a top value for home and office. The convenient press-to-talk function switch has a "lock-on" position for continuous "hands-free" transmitting. In addition, a volume control is provided to adjust listening level. Ask for complete information on the basic 2-station system Stock No. 83 YX 917, or additional single stations Stock No. 83 Y 941.
(For further details encircle index code 0725)

epoxy-metal compound From Borden Chemical Company, specially designed compound — called Elmer's All-Purpose Epoxy Metal Compound — to fill, bond, and repair steel, iron, aluminum,

(Concluded on next page)

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SHOP EQUIPMENT NEWS

(Concluded from previous page)

bronze, brass, lead, tiles, concrete, brick, marble, ceramics, porcelain, wood, glass, leather, fabrics, and most hard plastics. It is a two-part system consisting of metal-filled resin and hardener. Available in half-pint, pint, quart, gallon, and larger size units, each unit consists of a can of metal-filled epoxy resin and a can of hardener which mixes to double the amount of the unit size. For more complete information, and prices, please write to the company.

(For further details encircle index code 0726)

DESCRIPTIVE MATERIAL

From Brown & Sharpe Manufacturing Company, Bulletin MM55, covering complete specifications, and including illustrations on the construction features, operations, and optional equipment for their Dynamaster No. 2 Universal Milling Machines. These machines are available with either 3, 5, 7½, or dual 10/5 horsepower spindle drive motors and an exclusive automatic climb milling arrangement. Bulletin is free.

(For further details encircle index code 0727)

From Electronic Instrument Company, Inc., newly published 3-color, 28-page catalog covering their complete line of stereo and mono high fidelity equipment, test instruments, ham gear, citizens radios, and transistor radios. Over 80 items are fully described in the catalog, including new equipment. Available by mail on request from the company.

(For further details encircle index code 0728)

From R. K. LeBlond Machine Tool Company, Bulletin HD 461, describing and illustrating in its 16 pages, the LeBlond 4025 NK Heavy Duty Lathe. This peak-performance lathe in the most wanted big size is available in both manual and Servo-Shift models. Servo-Shift makes shifting gears almost effortless, with single hand-wheel selection of cutting speed (FPM and RPM). Options include RPM and FPM selectors at the apron, and digital readout at the headstock. The 4025 NK has been redesigned with new headstock, tailstock, and carriage to provide the finest in big lathe performance. Bulletin available on request.

(For further details encircle index code 0729)

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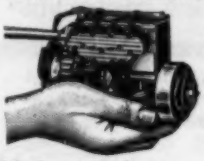

These projects will teach your students all machining operations as well as the principles of gasoline and steam engines.

Illustrated catalog of Miniature Engine Castings and Blueprints FREE if requested on school letterhead. (Others 25c)

*Student Appeal

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READER'S SERVICE SECTION

INDEX TO SHOP EQUIPMENT

The index and digest of advertisements below are provided for your convenience in requesting free product information, catalogsd an literature offered by the advertisers and the manufacturers listed in Shop Equipment News. To obtain this information or literature, encircle code numbers, sign the card, and mail. Your request will receive prompt attention.

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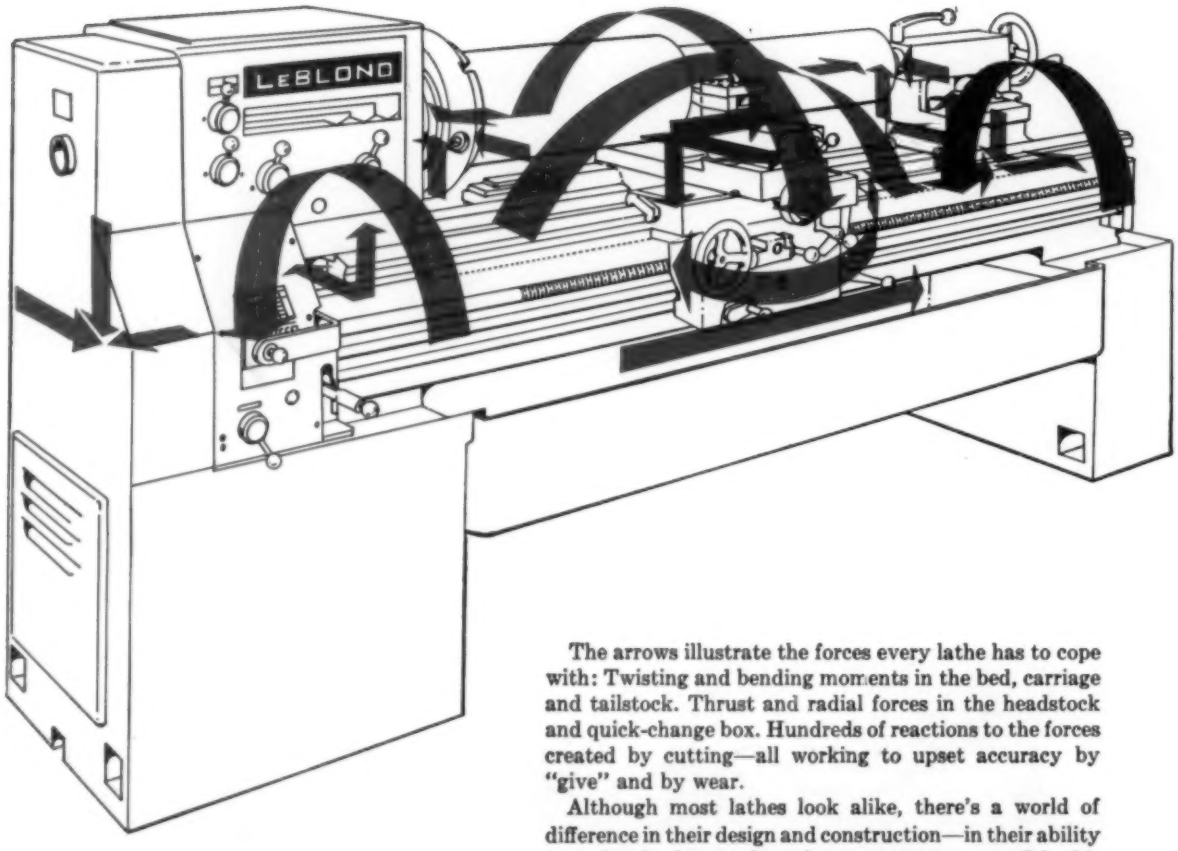

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